CANADIAN
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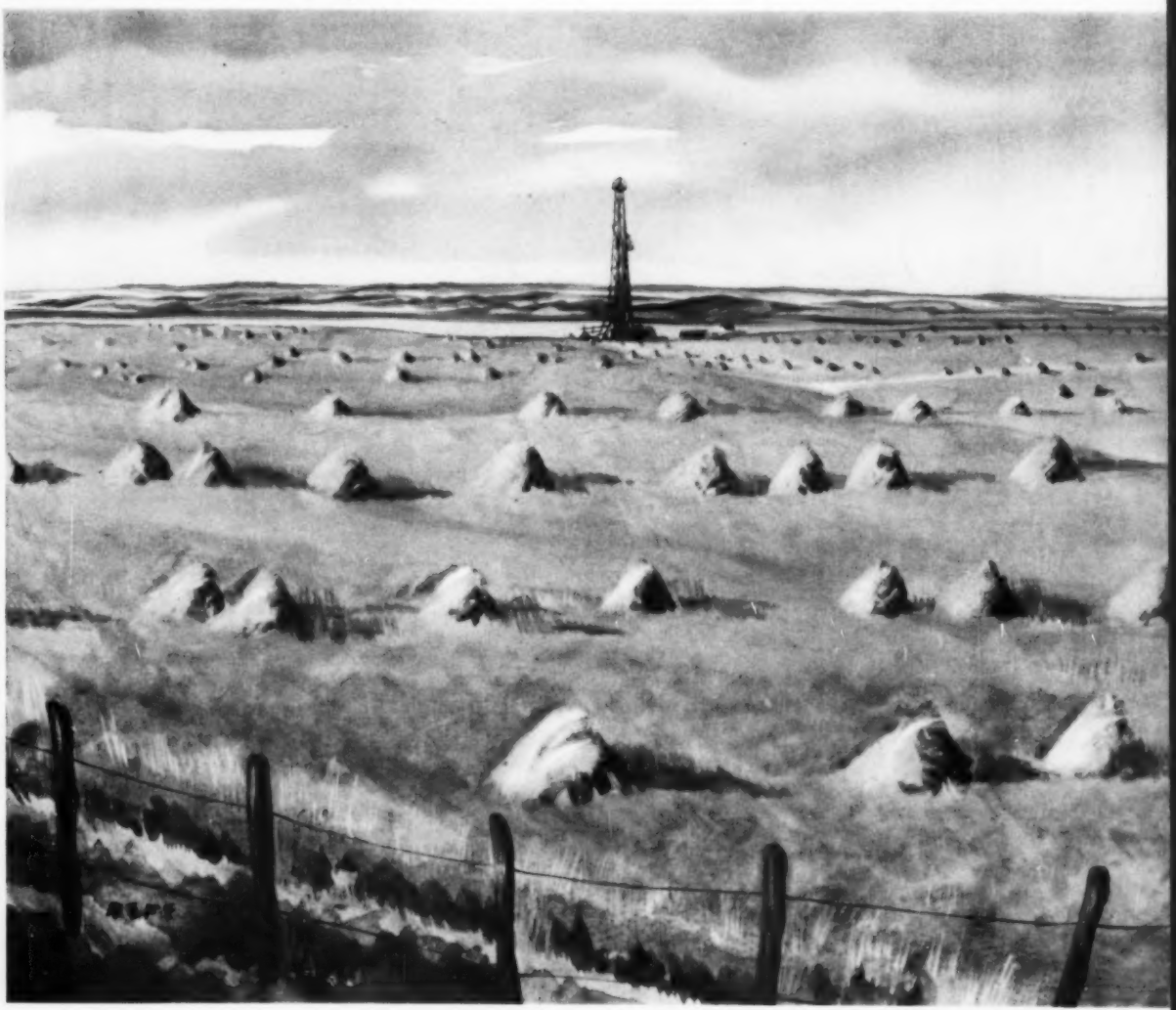
NUMBER

World Petroleum

APRIL, 1951

ONE DOLLAR PER COPY



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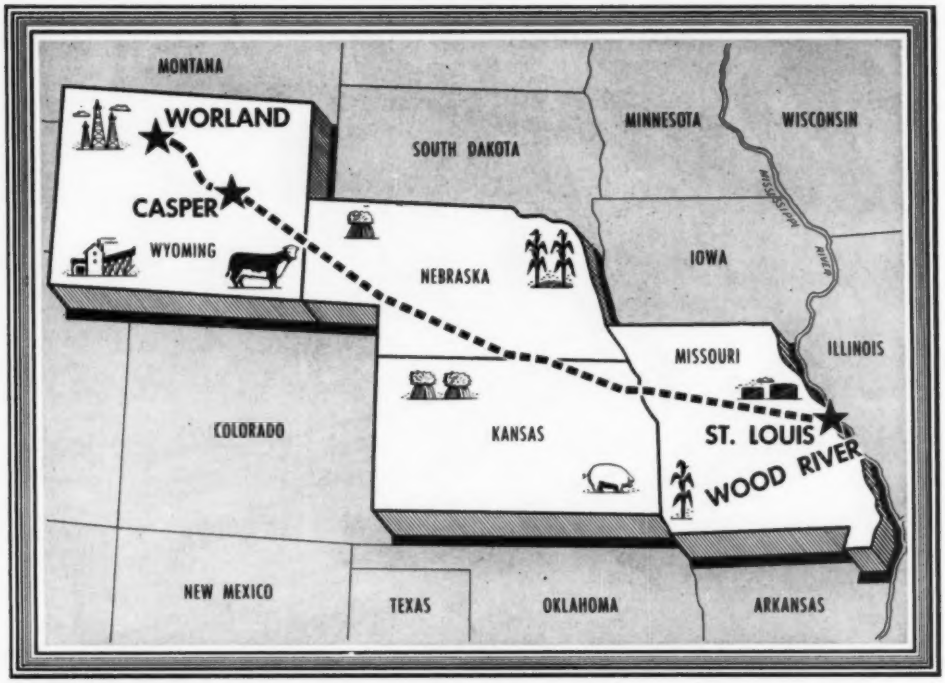

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Sponsored by five major oil companies—including Sinclair—a 1000-mile, $60,000,000 pipe-line from Worland, Wyoming to a point near St. Louis is under construction. The line will bring crude oil from Rocky Mountain reserves to the people of mid-America, at low transportation cost.

This great project is an example on the one hand, of oil industry *cooperation*—and on the other, of oil industry *competition* . . . to serve people better. For, once the crude reaches the pipe-line terminal, each of the companies starts at scratch to compete for business *on its own.*

A continuous flow of *more and better oil products* for the American people is one result of this constant competition. No company in the oil industry can escape the challenge. Sinclair meets it with never-ending research and ever-improving production, transportation and marketing methods—which are among the reasons why Sinclair is . . . *A Great Name In Oil.*

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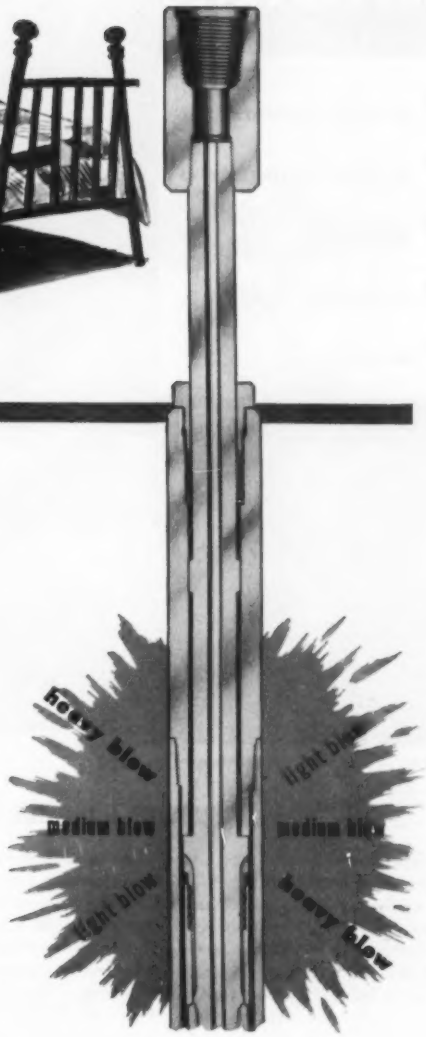

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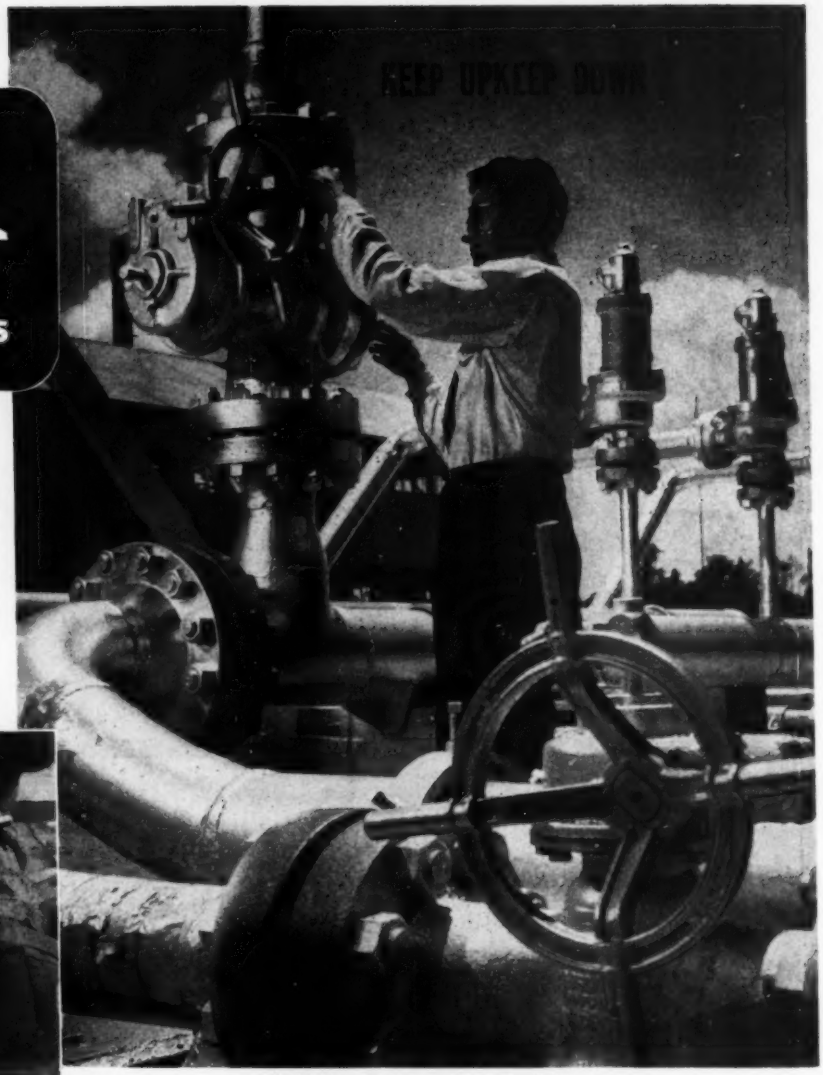
Audco-Nordstrom valve on extreme temperature line



Audco-Nordstrom gear operated valves on high pressure lines

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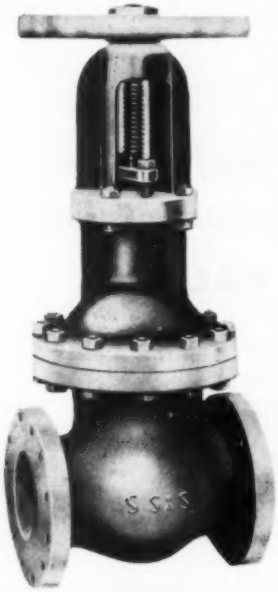

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Conduit-type, double-seating disc in this new Crane valve has circular openings that coincide with seat openings. Flow resistance is reduced to a minimum. There are no pockets to accumulate dirt or contaminating fluids. Turbulence and erosion of seating surfaces are avoided.

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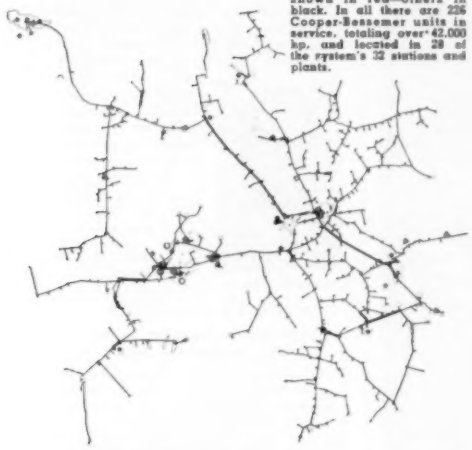
ON THE LONE STAR MAP....

★ Compressor stations
△ Cycling plants
○ Gasoline plants
□ Generator units

....30 years of Cooper-Bessemer power from early horizontals to the latest GMV Turboflows



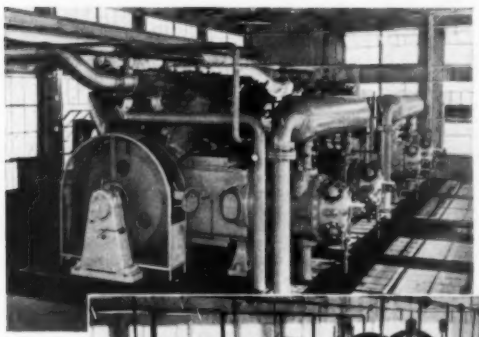
Cooper-Bessemer powered stations and plants are shown in red—others in black. In all there are 226 Cooper-Bessemer units in service, totaling over 42,000 hp, and located in 28 of the system's 32 stations and plants.

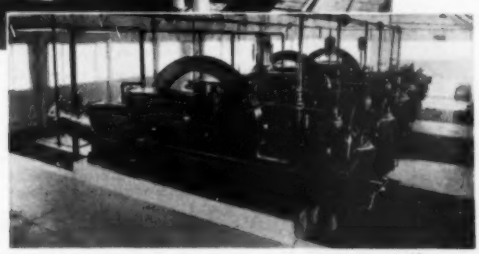
THE map pictures the Lone Star Gas Company's complex system as it is today. It is also evidence of this company's progress, wise management, sound growth . . . and success.

For over 30 years, Cooper-Bessemer has continuously played a major part in meeting Lone Star's power needs of every description . . . engine-driven compressor units, large and small, for gas transmission, cycling and natural gasoline service . . . gas engines of various types for driving auxiliaries and electric generators. Most of the earliest Cooper-Bessemer units, 30 years old and older, are still in regular service, giving efficient, dependable performance!

It's this kind of performance that justifies the confidence Lone Star and other companies show in Cooper-Bessemer products and engineering. It will continue to work to Lone Star's advantage with their latest Cooper-Bessemers—modern GMV Turboflows, for compressor service at lower-than-ever cost.

Below: Two modern, latest type V-angle compressors, Cooper-Bessemer 660 hp GMV-6 Turboflow units, in Lone Star's Gainesville Station.





Left: These Cooper-Bessemer 170 hp Type 75 horizontal compressors, installed in Fox Station 22 years ago, are still in continuous service.

The Cooper-Bessemer Corporation

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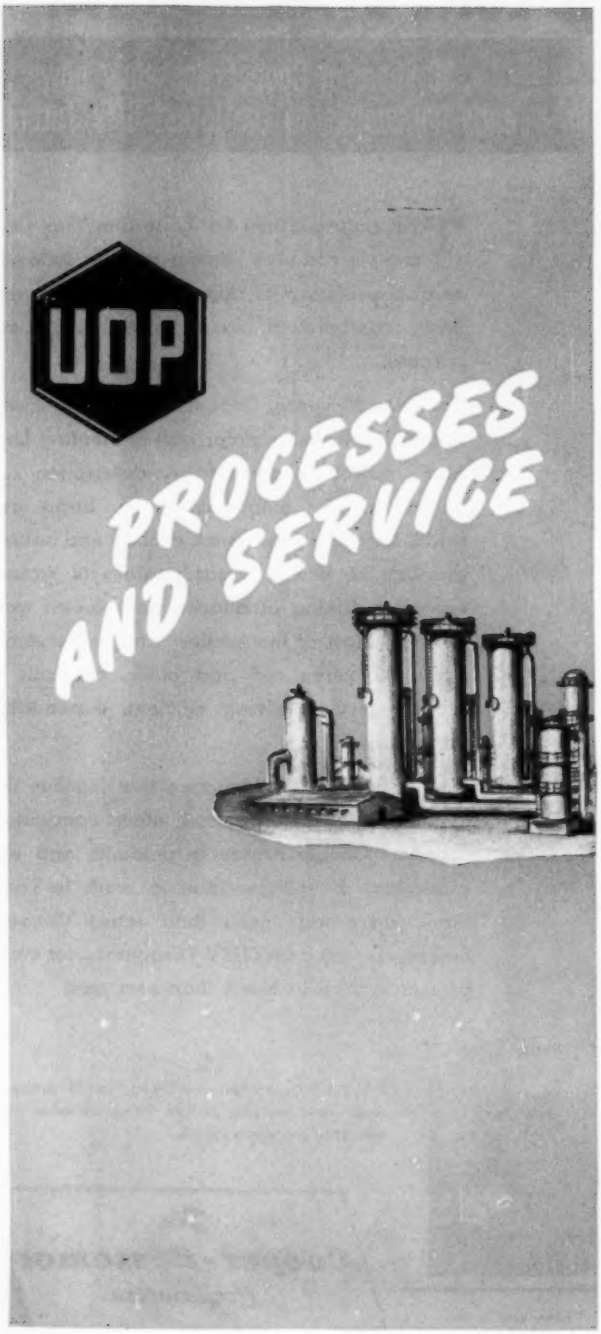


Platforming Unit to Upgrade Kendall Straight Run—Add Facilities for Defense

By Howard V. Smith,
Refinery Superintendent
Kendall Refining Company

Our decision to install a 1500 barrel Platforming unit was made in recognition of the constantly upward trend of gasoline octane ratings for the knockless operation of increasingly higher compression motors. However, from the beginning possibilities inherent in this type of plant for the production of petro-chemicals were thoroughly explored and excess capacity was incorporated in the design so that modification could be made at a later date for that purpose.

Howard V. Smith

Competitive Situation Called for Higher Octane

A survey of gasoline quality in the nearby Pittsburgh area revealed the following average octane ratings for house brand and premium motor fuels:

	Research Method	*Motor Method*
House Brand	86.2	80.2
Premium	91.8	83.1

Bradford Grade Penna. crude, to which Kendall, being one of the largest producers of 100% Pennsylvania grade lubricating oils, is committed, contains a relatively high proportion of low octane gasoline and naptha which cannot be brought up to the above standards by the addition of tetraethyl lead alone.

This crude runs about 40% gasoline and naphtha, boiling up to 400°F. end point. Sulphur content is low and the combined product has excellent volatility. The research octane number is 50 clear and 70 with 3cc's TEL. Twenty-three per cent of the crude oil is available for cracking in the Dubbs continuous coking plant which yields 77 per cent of cracked gasoline and polymer on the charge. Thermal reforming of straight run naptha is included in the Dubbs plant operation.

All Processes Explored

Our engineers made a thorough study of available processes before reaching a decision that Platforming offered the most economical solution to our problem. Engineering studies showed that thermal reforming to the extent considered economical would still leave the anti-knock quality of the product short of the ultimate goal.

Pilot plant studies in the Universal Oil Products Company's laboratories demonstrated that the Platforming process would convert the 400 end point full boiling

range gasoline into 95 octane gasoline with 3cc's TEL, with a yield of more than 90 per cent by volume. Details of this pilot run are expressed in the following table:

Inspection of Kendall Straight Run, Fractionated Reactor Charge and Stabilized Platformate

	Full Boiling Range Straight Run Gasoline	*Reactor Charge*	*Platformate*
API Gravity	64.9	58.0	58.2
IBP	90	180	102
5%	117	201	134
10%	136	211	150
30%	198	235	188
50%	243	264	225
70%	290	306	262
90%	358	360	327
95%	381	377	364
EP	394	399	411
RVP	10.3	0.7	9.5
Octane Ratings			
F-1 Clear	50.1	40.2	84.1
F-1 3cc's TEL	69.7	61.2	95.3
F-2 Clear	49.5	38.0	78.8
F-2 3cc's TEL	69.5	60.8	87.9

Consideration of Defense Requirements

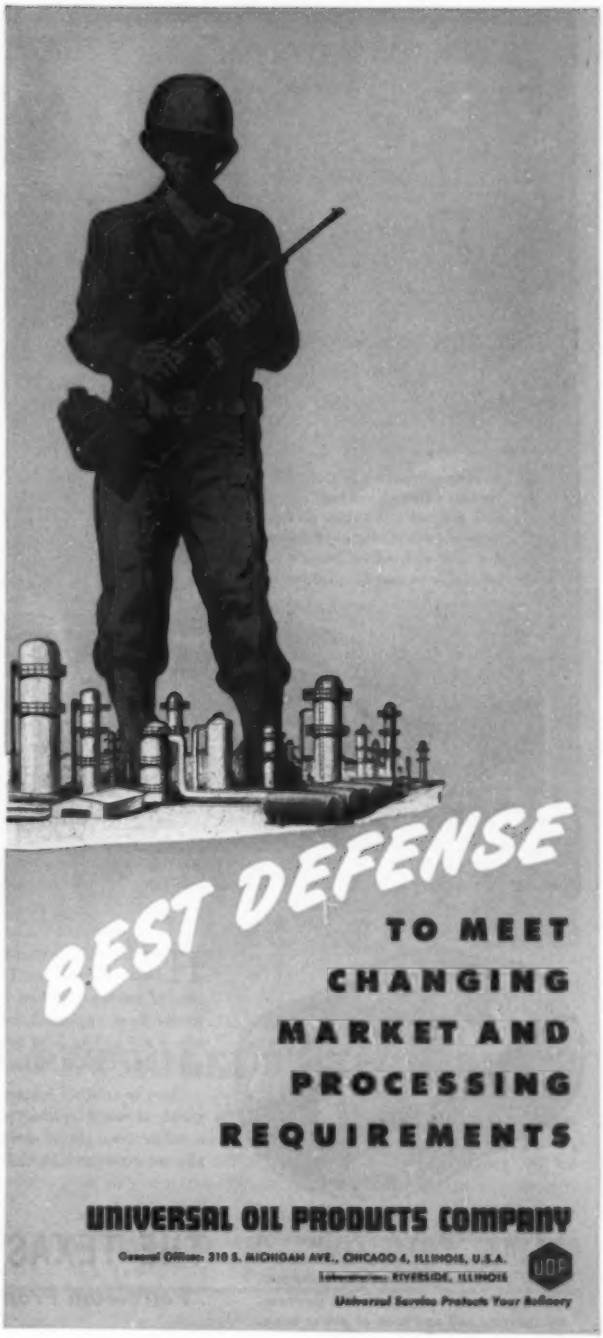
Another consideration was the fact that in the event of a drastic shift in requirements due to the impact of a defense or war economy on the nation, our Platforming facilities could be converted to the production of aromatics, aviation gasoline components, benzene, toluene and other petro-chemicals which might be needed for military purposes. While this conversion would require certain modifications in the unit itself, as well as additional feed stocks from outside sources, the change-over would not radically disrupt our operations and full utilization of the new unit would be possible.

Special Design Features

The plant design for our Platforming unit, incorporates some special features, particularly applicable to our circumstances. Since our charging stock is well fractionated and free from heavy ends, it was decided that a suitable reactor charge stock could be prepared from it by distilling off the light ends in a depentanizer. Utilization of this method instead of a prefractionator, reduced size of the equipment as well as the operating cost.

Air contamination of the charge stock will be minimized by blanketing the charge tanks with dry gas from the vapor recovery unit of the refinery. The depentanizer overhead will be depropanized to produce a blending stock for volatility control. Depropanizer overhead will be charged to the Platformer stabilizer to reduce butane loss. Recycle gas and reactor charge will be mixed before entering the heater and heated as one stream instead of separately.

Our new Platforming unit was designed by Universal Oil Products Company in collaboration with our engineering department. It is being erected by Procon Incorporated, and is expected to go on stream in March of 1951.



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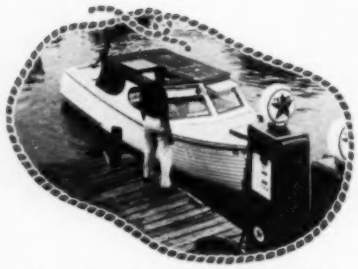

On coastal waters, navigable lakes and inland waterways all over the U.S.—Texaco is a familiar, welcome sign of marine service and supply to boat owners. Every year some 600-million dollars are spent for the purchase, maintenance and operation of power boats.

HISTORY reveals that man paddled, pedalled and rowed gently down the stream. Then came *power*, following the introduction of petroleum. Just before the turn of the century the first motor boat appeared, later, the outboard motor. Today there are some 3½ million inboard and outboard pleasure boats in use in the United States.

Here is another instance of petroleum research and development at work—giving new pleasure, new industry. It is also another example of serving the interests of the individual and the nation—through the free competition of free men.

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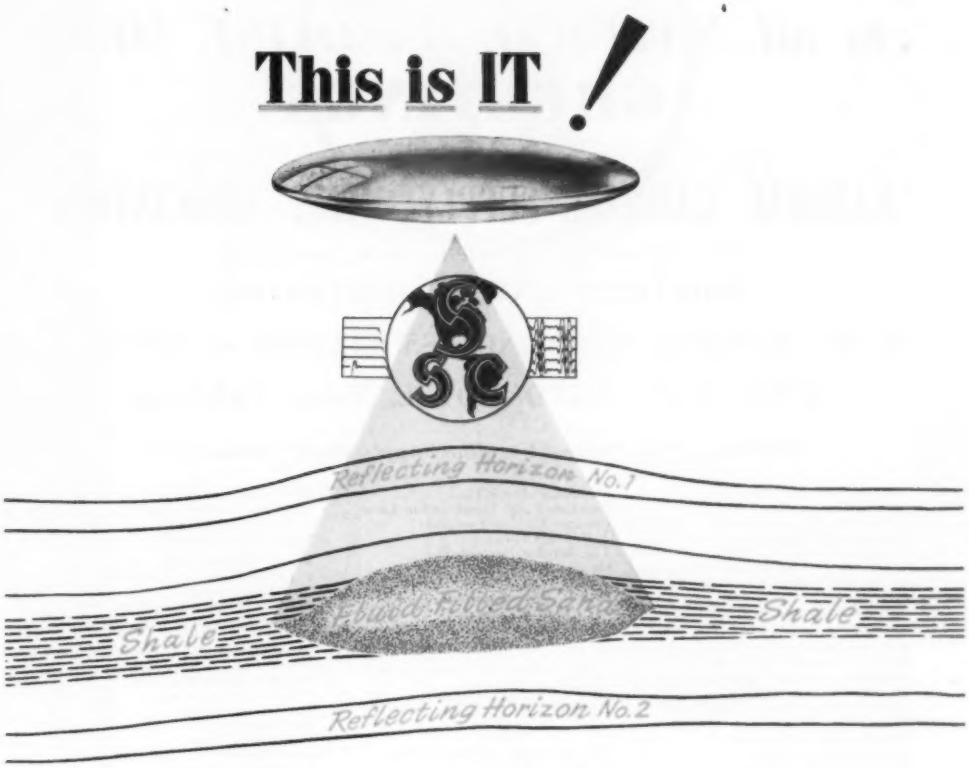

a new method for the location of . . .

Sand Lens Type Oil Fields

Continuing research and development by SSC, to further utilize the possibilities inherent in the reflection seismic method to locate non-structural type oil fields, has resulted in a new approach to the location of stratigraphic traps.

This new seismic method, another *first* for SSC, for the location and delineation of *sand lens* type oil fields has been proved by 17 oil wells drilled to date by SSC clients.

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MATHIESON CHEMICAL CORP.
McCOLL-FRONTENAC OIL CO., LTD.
MID-CONTINENT PETROLEUM CORP.
MITSUBISHI OIL CO., LTD.
NATIONAL PETROLEUM COUNCIL OF BRAZIL
PAN AMERICAN REFINING CORP.
PENNZOIL CO.
PHILLIPS PETROLEUM CO.
POLYMER CORP., LTD.
PURE OIL CO.
SHELL CHEMICAL CORP.
SHELL OIL CO.
SHERWIN-WILLIAMS CO.
SINCLAIR REFINING CO.
SKELLY OIL CO.
SOCIETE DES RAFFINERIES DE PETROLE DE LA GIRONDE
SOCIETE GENERALE DES HUILES DE PETROLE
SOCIETE INDUSTRIELLE BELGE DES PETROLES
SOCONY-VACUUM FRANCAISE
SOCONY-VACUUM OIL CO.
E. R. SQUIBB & SONS
STANDARD OIL CO. (INDIANA)
STANDARD OIL CO. (OHIO)
STANDARD OIL CO. OF CALIFORNIA
SWIFT AND CO.
TEXAS CO.
UNION OIL CO. OF CALIFORNIA
UTAH OIL REFINING CO.
WASATCH OIL CO.
WOOD RIVER OIL & REFINING CO.

TEXACO
REG. T. M.

Seven Mighty Crackers...for Texaco!

When The Texas Company built its first Fluid catalytic cracking unit back in 1942, Kellogg did the job. Since that time, Kellogg has erected seven additional crackers for Texas refineries in New Jersey, Illinois, Oklahoma, Wyoming, Texas and California.

Historically, Kellogg undertook its first job for Texaco back in 1929...a thermal cracker at Amarillo, Texas. During World War II, Kellogg designed a Hydroforming unit for the production of high octane components for aviation gasoline. Built at Lockport, Illinois, it was the forerunner of Texaco's vast post-war modernization and expansion program.

Within the past year, Kellogg has completed thermal reforming and catalytic polymerization facilities, as well as a catalytic cracker at Texaco's new refinery, Eagle Point Works, at Westville, New Jersey.

THE M. W. KELLOGG COMPANY

A SUBSIDIARY OF PULLMAN INCORPORATED

for fifty years an integral part of processing history

NEW YORK JERSEY CITY LOS ANGELES TULSA HOUSTON TORONTO LONDON PARIS

Portrait at

This year is Kellogg's fiftieth of service to industry. At this time naturally, as a group of men—known collectively to the modern business world as The M. W. Kellogg Company—we can think back nostalgically. We can remember the chimney stacks

"Against Tomorrow's Conditions"

The first two of these camera "portraits" of M. W. Kellogg today which have already appeared in this publication, high-lighted the major aspects of the chemical, metallurgical and process research carried on by the Kellogg organization.

This month, a few of the continuing development projects based on this research are described — with indications of their importance in the advancement of processing, engineering and fabrication.

1. ***WHILE THE PRIMARY ACTIVITY*** of the Metallurgical Engineering group is concerned with the everyday problems of Kellogg operations, these facilities have also been utilized in connection with national defense. Because of their knowledge of metals and heat exchange, the services of these men have been required in the design of rockets and jet turbines. Here you see the engineering personnel assigned to this task.

4. ***IN GAS AND ELECTRIC FURNACES*** such as this, metals are subjected to temperatures approaching those of rocket engines in operation . . . and useful data from post-heat conditions of the materials can then be derived. Evidence of the success of Kellogg's work in these fields is seen in the fact that this development group has recently perfected a new method of heat exchange jacketing for combustion chambers.

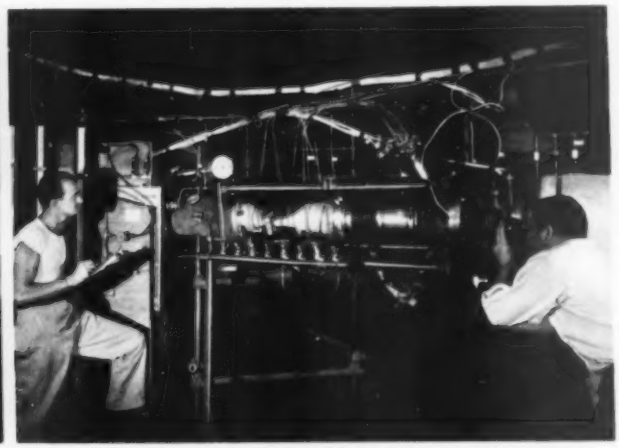
5. ***KNOWLEDGE OF THE MECHANISM*** of combustion of various fuels is as essential to the design of familiar process furnaces as it is to special combustion chambers. Here you see a test chamber for rocket and jet fuel study. In the future, such studies will stand industry in good stead as process plants are required to produce special jet and rocket fuels in quantity.

Fifty... no. 3

KELLOGG
1901-1951
50th Anniversary

we built in 1901 . . . the first crude vessels for oil refiners in the 'teens . . . our first combination unit. The forty-odd Fluid cat crackers built in these years. But, after all, The M. W. Kellogg Company is only a factor as it is able to serve industry today. For that reason, we are presenting this series of monthly camera studies which document our belief that a truly integrated organization can better serve industry to achieve greater earning power. This is No. 3 in the series.

2. *AT FIRST GLANCE* these specialized projects may appear far removed from the direct interest of the oil refiner. But the facts are just the reverse. The solution of rocket and jet turbine design problems opens new ranges of operating temperatures, new types of heat exchange equipment and tremendously improved turbines and pumps. Modern dynamometers are employed in studies of various types of turbines and pumps.



3. *IN THIS MINIATURE TEMPERATURE CHAMBER,* stratospheric frigidity can be created outside of a piece of equipment while it operates at super temperatures inside, or vice versa. This is a modern counterpart of the development which Kellogg instituted more than twenty years ago, when it began investigating the effect of low temperatures on metals in connection with propane lubricating oil processes.

6. *AN IMPORTANT PHASE* of the study of fuels is the observation and recording of the act of combustion itself—which is carried out by this apparatus—by means of high-speed color photography of flame characteristics and fuel burning. Other facilities include stands and firing pits for the testing of completed prototype rocket motors. The group has designed and built rocket motors with thrusts up to 30,000 lbs.

7. *THESE ELECTRONIC SIMULATORS* are indicative of the equipment placed at the disposal of the company's development men. Similar in purpose to the giant electronic calculating machines, they provide shortcut answers to design problems requiring extensive time-consuming mathematical calculation.

NEXT MONTH

. . . in the fourth in this series of camera studies of M. W. Kellogg today . . . you will see how Kellogg channels the results of development into a specific industrial project.

Special Treatment to Make a Tube Stand Up!

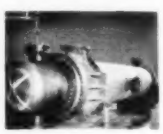
M. W. KELLOGG

Be it for high pressure or high vacuum . . . 1800F. or –260F. . . . corrosive or erosive service, exclusive manufacturing techniques lengthen the operating life of Kellogg heat exchange equipment.

- Pressure Vessels
- Vacuum Vessels
- Fractionating Columns
- Drums and Shells
- Heat Exchangers
- Process Piping
- Hi-pressure—Hi-temp Power Piping
- Bends and Headers
- Giant One-Piece Bends
- Forged and Welded Fittings
- Radial Brick Chimneys

Continuing Basic Study of heat exchange by Kellogg development groups over 20 years has produced unduplicated design data.

Shop Layout Craftsmen have had experience on all types of heat exchangers, from marine condensers to jet engine combustion-chambers.



Rigid Quality Control is maintained by inspectors reporting directly to *Shop Management* rather than to *Production* executives.

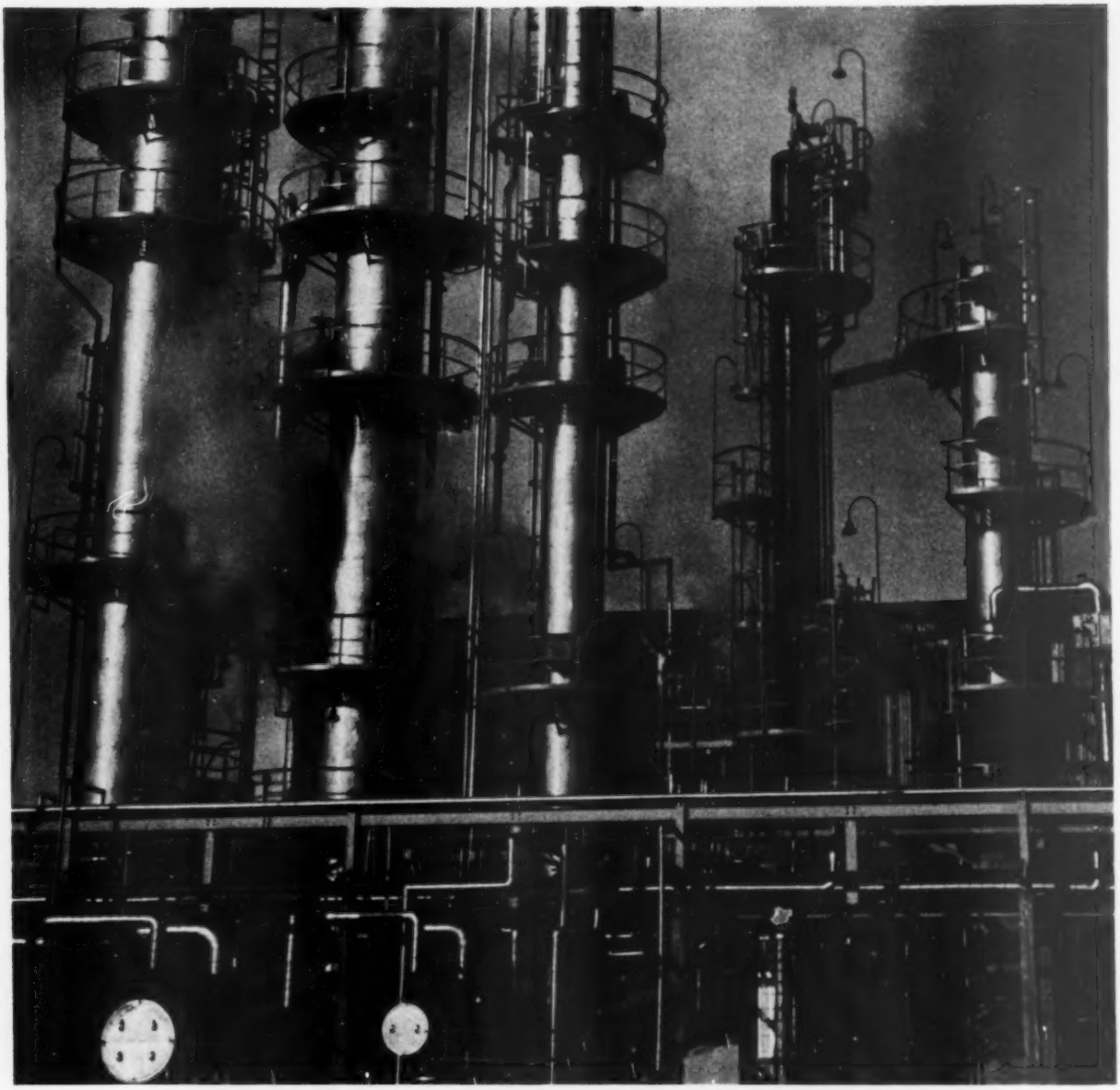
Extensive Shop Facilities, from plate bending to stud threading, permit *complete* fabrication of any type heat exchanger.

Special Shop Techniques—the component parts of each exchanger are fabricated as a production unit, building in the advantages of "tailor-made" fit.

NEWS FOR OPERATORS IN WESTERN CANADA!

The Canadian Kellogg Company Ltd. has established complete shop facilities for the fabrication of all types of piping at **EDMONTON**, Alberta. Inquire directly or through any Kellogg or Canadian Kellogg office.

The M. W. Kellogg Company *(A Subsidiary of Pullman Incorporated)* **New York, Jersey City, Los Angeles, Tulsa, Houston, Toronto, London, Paris**



New towers on new horizons

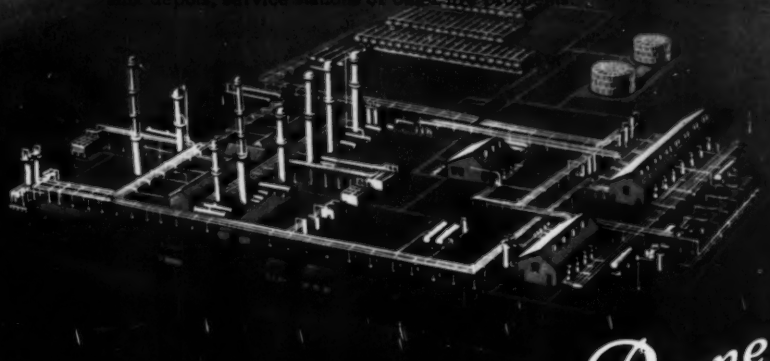
● The rapid growth of Canadian Industry is reflected in the increasing demand for Petroleum Products. In keeping with this growth, Shell's refining capacity continues to increase too. This spring, the modern installations at Shell's Montreal East Refinery, including the new catalytic-cracking unit, will come on stream. The date represents another milestone in Shell's long partnership in Canadian Industry.

SHELL

SHELL OIL COMPANY OF CANADA, LIMITED

Every Refinery and Tank Installation Engineer knows . . .

that he is surrounded every day by the most serious of all fire risks. He knows, too, that every fire no matter how small must be stopped immediately if he is to avoid a major fire where all his experience combined with the use of major foam fire fighting equipment will be needed to subdue it. The Pyrene Company is the largest manufacturer in the world of Mechanical Foam Fire Fighting Equipment and Foam Compound and more major oil fires have been extinguished with this equipment than with any other. The Company's engineers are at your disposal in any part of the world for consultation on this vitally important matter. Write now for their expert advice and recommendations concerning oil and spirit fires, affecting refineries, storage tank depots, service stations or other fire problems.



THE BEST KNOWN NAME IN FIRE PROTECTION

Pyrene TRADE MARK FIRE APPLIANCES

THE PYRENE COMPANY LIMITED. (Dept. W.P. 4) 9, GROSVENOR GARDENS, LONDON, S.W.1, ENGLAND

Associated with Pyrene Company of America

Looking for tubes with a better life/cost ratio? Ask the experts!

This month's report is on: **SILMO**

Offers good combination of high temperature strength and oxidation resistance. At 1000°F. — 1150°F., it has about twice the strength of carbon steel and oxidation resistance comparable to 4-6 Cr. Mo. For use in cracking furnace, heater, high pressure boiler and superheater tubes.

ONE OF 23 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	16-13-3
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	25-20
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-12
Silmo	Sicromo 3	Sicromo 9M	35-15*
DM	4-6% Cr.-Mo.	18-8 Stainless	16-25-6*
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	

*Not available as seamless tubing at the present time.

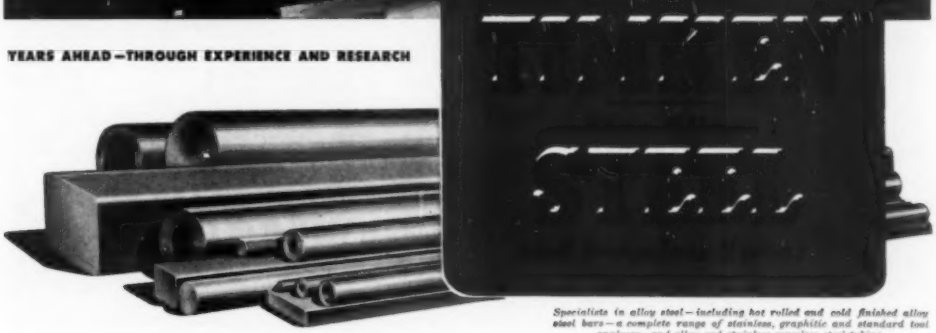
If your high temperature tubes either fail too soon or last longer than needed, they're costing you too much. Only *one* high temperature steel can give you the best life/cost ratio. It's the one that's tailor-made for your particular operating conditions.

To make sure you get the *right* steel, consult the recognized authorities in this field—the Timken Company metallurgists. Their recommendations are backed by 21 years of pioneering research and the widest field experience. They have 23 analyses to choose from. And uniform tube quality is assured by our complete control from melt shop through final inspection.

Let the Timken Company's "RSQ"—Research, Supply, Quality—solve *your* tube problems. Ask the experts! The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, O. Cable address: "TIMROSCO".

Photo shows metallographic laboratory at the Timken Company, where structural characteristics of high temperature steels are determined. The Timken Company was first to test high temperature steels, and still leads in that research today.

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing

What Happens When 150,000,000 People Say:

"I WANT!"

THE STORY OF OIL

COLONEL Edwin Drake's oil well, drilled in 1859, produced only 20 barrels daily . . .

But it gave people a taste of the benefits of petroleum—and a great industry was off to a flying start!

The first drilling rigs—first refining equipment—were adequate for that early demand.

But invention of the automobile, airplane, Diesel engine and other great machines in turn demanded great invention in oil—and old-fashioned equipment gave way to scientific research laboratories, modern refineries, pipelines, tankers and tank cars.

Each year demand made them bigger and better!

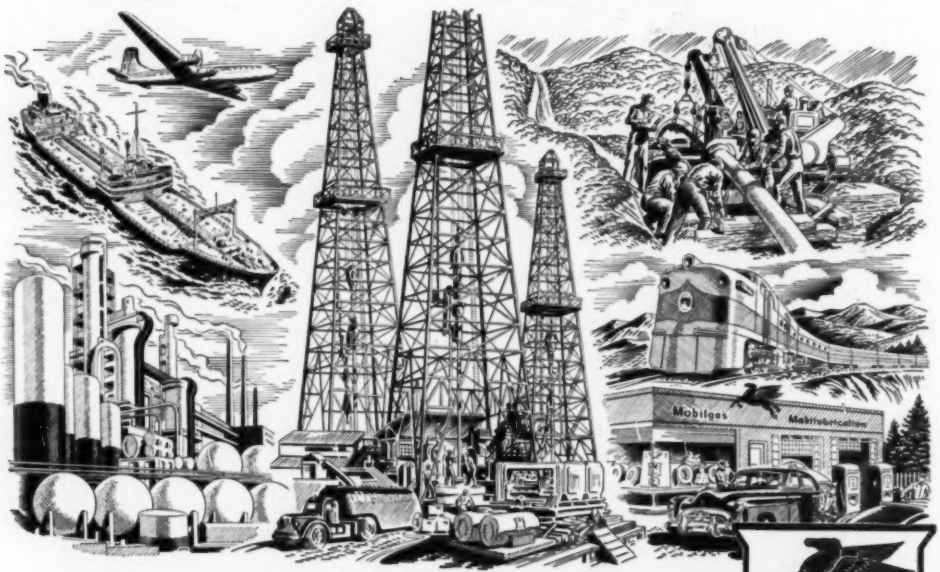
Today, thousands of oil companies with oil fields, refineries, bulk plants, service stations and cost-cutting transportation systems—deliver over 1,840,000,000 barrels of petroleum yearly—meet U.S.A.'s demands for *value in oil.*

And, today, the responsibilities of Socony-Vacuum, one of the oldest companies in the industry, are constantly mounting . . .

Unprecedented demand for petroleum products calls for expansion in every phase of our efficient, coordinated operation . . .

46,400 independent "small" businessmen must be kept *competitive*—supplied with what it takes to provide a *big money's worth* for you—a good living for themselves.

When 150,000,000 Americans say, *"I want,"* it takes businesses of all sizes to deliver!



DEMAND DETERMINES BIGNESS

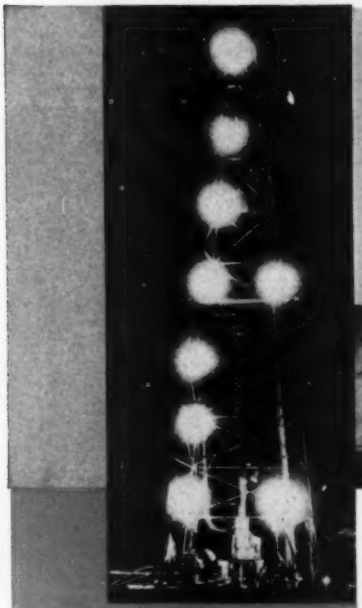
The Flying Red Horse Companies

SOCONY-VACUUM OIL COMPANY, INC. • MAGNOLIA PETROLEUM CO. • GENERAL PETROLEUM CORP.

SOCONY-VACUUM

JOY EQUIPMENT for the OIL FIELDS

THE WORLD'S LARGEST MANUFACTURER OF CORE DRILLS AND MOTORIZED DRILL RIGS



OIL FIELD STRING-A-LITE

Easily installed packaged lighting system for Portable Drill Rigs. Provides safe, troublefree lighting for oil drilling.

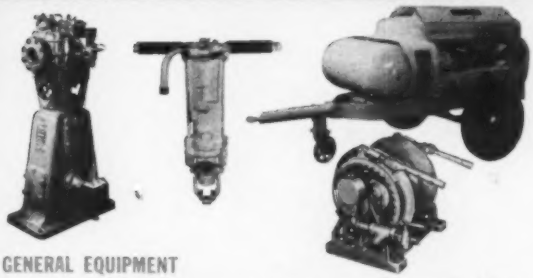
Package consists of neoprene encased connecting cable, connections and lighting fixtures. Write for detailed bulletin.

MOTORIZED DRILL RIGS

Available in seven models for core testing, electrical logging, seismograph, water well drilling, and slim-hole production to 5,000 feet.

Equipped with exclusive features designed for lower drilling costs, increased speed, and greater rig safety.

Write for detailed bulletins.



GENERAL EQUIPMENT

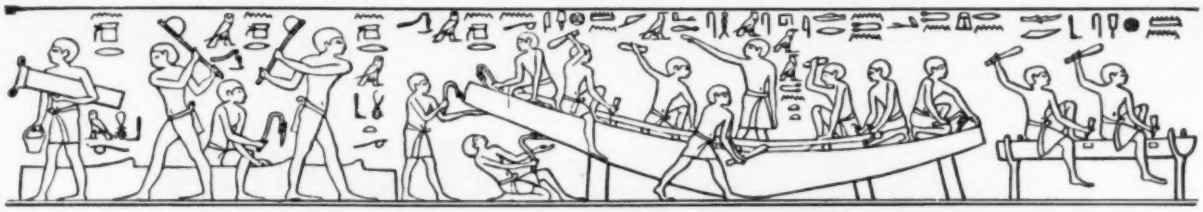
Portable and Stationary Air Compressors • Hand Held Drills • Hoists • Winches • Sheaves • Drill Pipe • Core Barrels • Fishtail Bits • Drag Bits • Water Swivels

W&D 03379

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



HIEROGLYPHICS · · · *with a modern meaning*

The workman of ancient Egypt knew the symbols of his trade. They helped him fashion stone and metal, wood and cloth, into the goods and structures which best served his era . . . The needs of our modern industrial civilization are different. Visitors to Sun Ship's mighty shops see in the making the intricate steel fabric of petroleum refineries and chemical plants . . . massive bubble towers, pressure vessels, condensers, cracking cases, and a vast array of special machinery and equipment for many industries.

But even a visitor from the days of Egypt's Pharaohs would recognize two familiar facts—that strange modern "hieroglyphics" guide precise assembly of today's steel behemoths . . . and that Sun Ship workers are masters in their knowledge of the symbols and crafts of their trades . . . The many modern industries served by Sun know these facts, too.

Illustration at top, reproduced from "The History of All Nations," shows ancient Egyptian shipbuilding as depicted on the tomb of Ti, at Sakkara. In contrast is the 55' regenerator being built by Sun.

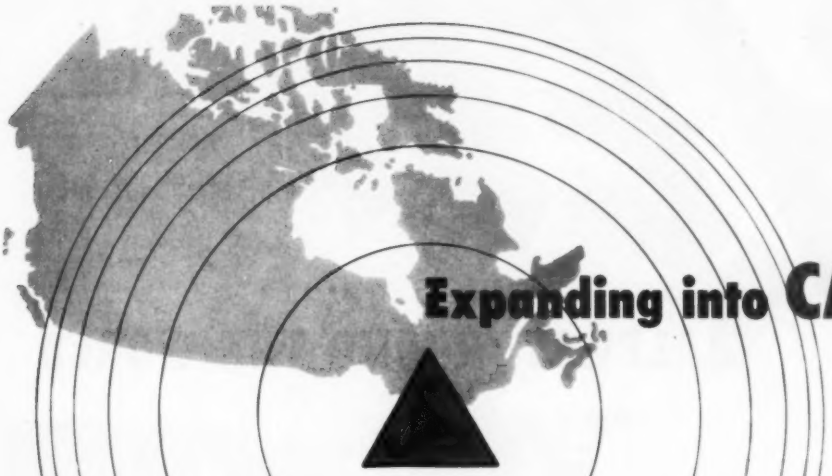
Sun

SHIPBUILDING & DRY DOCK COMPANY

SINCE 1916

ON THE DELAWARE · CHESTER, PA.

25 BROADWAY · NEW YORK CITY



Expanding into CANADA?

Consult STONE & WEBSTER CANADA LIMITED

Many American businessmen are today considering the opportunities for business in Canada. Many American corporations have already established offices and plants up north. If you are in either group, Stone & Webster can help you.

How? With a technical report, an appraisal or a survey to assist you in selecting your new plant location; with a highly competent and thoroughly experienced engineering and construction staff to design and build your new plant and facilities. Stone & Webster Canada Limited, our Canadian subsidiary, is prepared to bring to Canadian industry and to American industry planning to expand into Canada the same high standards of performance that our clients in this country have come to expect and appreciate.

In addition to having at their command the services of our engineering and construction organizations, Stone & Webster Engineering Corporation and E. B. Badger & Sons Company, clients of Stone & Webster Canada Limited may, at any time, call on the Stone & Webster Service Corporation for assistance in the solution of problems involving business management or on the Stone & Webster Securities Corporation for advice on questions relating to financing or refinancing.

Your inquiries are cordially invited.

STONE & WEBSTER, *incorporated*

STONE & WEBSTER ENGINEERING CORPORATION STONE & WEBSTER SERVICE CORPORATION
E. B. BADGER & SONS COMPANY STONE & WEBSTER SECURITIES CORPORATION
90 BROAD STREET • NEW YORK 4, N. Y.
STONE & WEBSTER CANADA LIMITED, 44 KING STREET WEST, TORONTO

TECHNICAL

HELP

HALFWAY 'ROUND THE WORLD

to insure the efficient, economical application of Caltex products— for all industry and transportation

QUALITY alone does not insure efficiency and economy. The promise of performance in Caltex petroleum products is part of the complete Caltex "package."

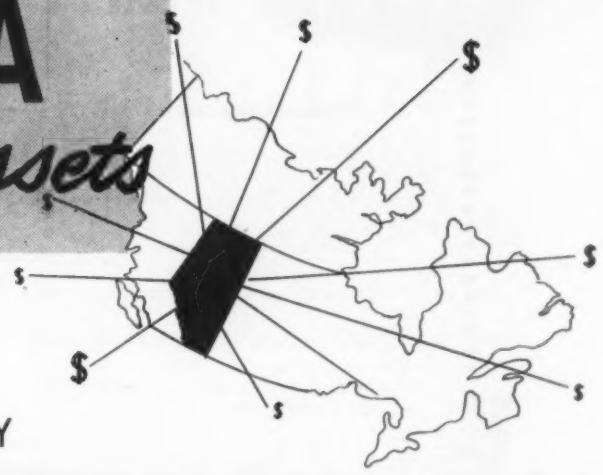
First—Caltex offers quality lubricants and fuels. Second—it offers these throughout the eastern hemisphere from convenient, reliable sources of supply. Third, and even more important, it makes available skilled engineering service that assures efficient, economical application.

CALTEX
REG T M

CALTEX PETROLEUM PRODUCTS

SERVING EUROPE...AFRICA...ASIA...AUSTRALASIA

ALBERTA
Natural Assets



ARE FAVOURABLY
AFFECTING THE WHOLE
OF CANADA'S ECONOMY

OIL and NATURAL GAS!

The Alberta Government has followed consistently a policy designed to assure the orderly development of Alberta's oil resources in the best interest of the people of the Province and of Canada as a whole. That policy, the soundness and fairness of which has already been demonstrated and established, embodies FIVE MAJOR POINTS TO WHICH THE GOVERNMENT IS COMMITTED AND FROM WHICH IT WILL NOT DEVIATE.

1. To take all reasonable steps necessary to encourage orderly development to meet the ever increasing demand for petroleum products and to make Canada less dependent on other countries for these essential products.

2. To insist that all development is carried on according to the best known engineering practices, thereby preventing waste and assuring the greatest ultimate recovery.

3. To establish prospecting and leasing regulations designed to effectively prevent monopoly, and encourage individual enterprise. Only by the existence of wholesome rivalry where free and competitive enterprise is carried on, can we expect to get the most active development.

4. To obtain for the people of the Province as a whole, a fair share of the returns resulting from the production of oil.

5. To assure the owner of surface rights fair and generous treatment in determining and awarding full and proper compensation for any loss, damage and inconvenience.

The soundness and fairness of this five point policy will commend it, not only to those interested in oil development, but to the public as a whole.

Alberta, Canada's richest province in natural resources is pouring out 95% of Canada's Petroleum from over 2,000 producing wells.

Alberta's production of oil will soon equal requirements of all Canada, at the present rate of development.

During 1951 Alberta oil production, will average 120,000 barrels of oil per day. Alberta wells are presently capable of releasing over 200,000 barrels per day. The province is now producing all the requirements for the Prairie Provinces.

The new Interprovincial Pipeline from Edmonton to the head of the Great Lakes will release Alberta oil to the large Eastern Refineries this year.

Alberta has the advantage of vast supplies of oil and Natural Gas at low cost for her industries and for the home. The use of natural gas, a clean fuel, eliminates soot and ash from Alberta's atmosphere.

GOVERNMENT OF THE PROVINCE OF ALBERTA

DEPARTMENT OF MINES AND MINERALS

HON. N. E. TANNER
Minister of Mines & Minerals

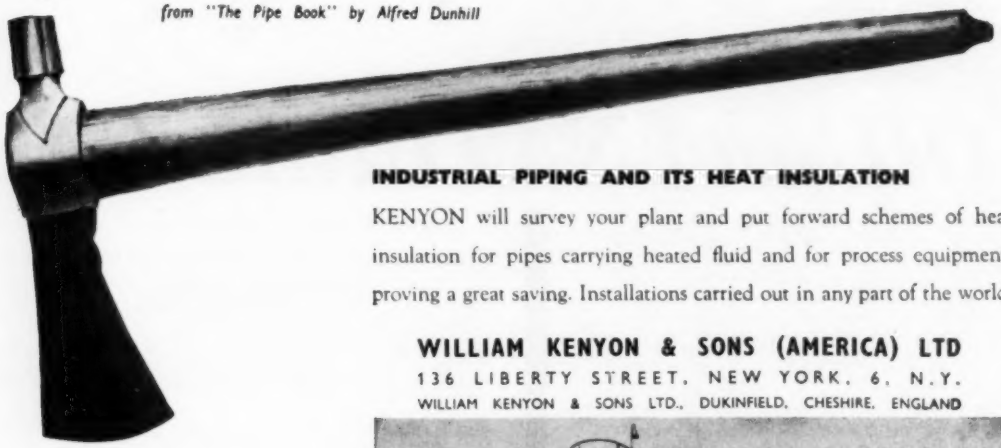
I. N. McKINNON
Deputy Minister

PIPES with a difference...

TOMAHAWK PIPE

Since the Indian brave carried a tomahawk, it was not unnatural that this weapon should be made to serve also as a pipe in the ingenious manner shown in the illustration. But this device was most probably the work, in the first instance, of a European craftsman, for both English and French supplied the Indians with "trade" tomahawks of steel.

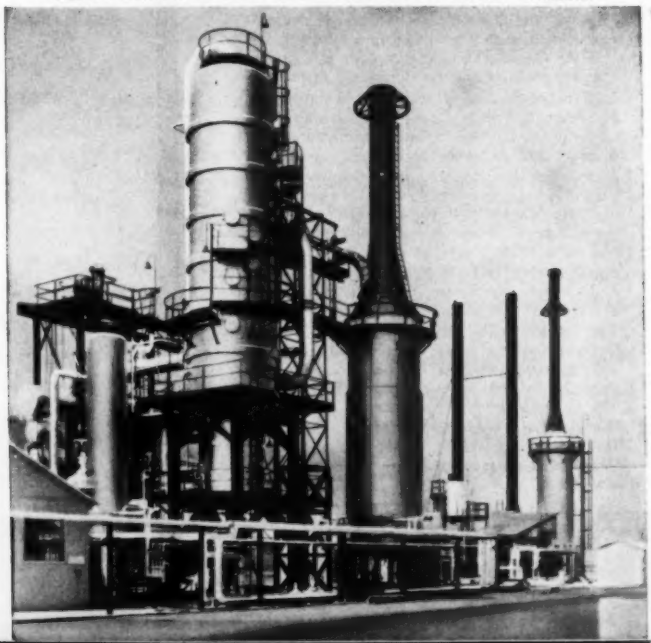
from "The Pipe Book" by Alfred Dunhill



INDUSTRIAL PIPING AND ITS HEAT INSULATION

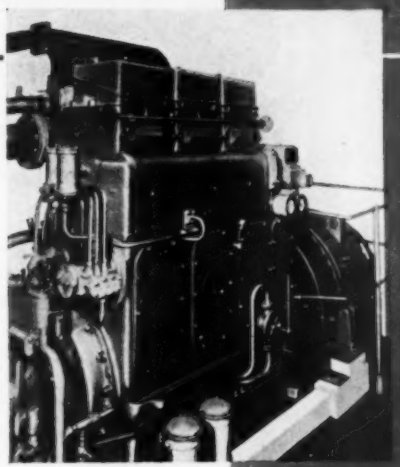
KENYON will survey your plant and put forward schemes of heat insulation for pipes carrying heated fluid and for process equipment, proving a great saving. Installations carried out in any part of the world.

WILLIAM KENYON & SONS (AMERICA) LTD
136 LIBERTY STREET, NEW YORK, 6, N.Y.
WILLIAM KENYON & SONS LTD., DUKINFIELD, CHESHIRE, ENGLAND



KENYON *Planned* HEAT INSULATION

'ENGLISH ELECTRIC' DIESEL ENGINES



DUAL-FUEL ENGINES

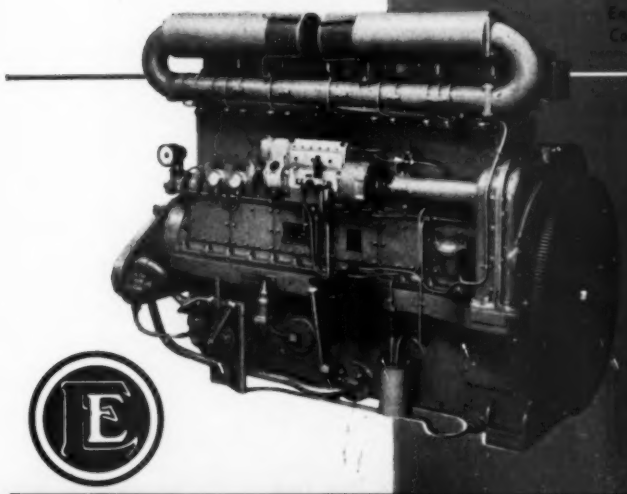
'ENGLISH ELECTRIC' DUAL-FUEL ENGINES ARE AVAILABLE WITH OUTPUTS RANGING FROM 150 B.H.P. UPWARDS

The illustration shows a [illegible] diesel engine of the E.V.S. type

Full details of the complete range of 'ENGLISH ELECTRIC' Diesel and Dual-fuel Engines can be obtained on application to the Company's Diesel Engine Division at Rugby, England.

DRILL-RIG UNITS

'ENGLISH ELECTRIC' DIESEL ENGINES ARE SUITABLE FOR DIRECT DRIVE OR FOR INSTALLATION IN DIESEL-ELECTRIC DRILL-RIG UNITS



The ENGLISH ELECTRIC Company Limited

DIESEL ENGINE DIVISION - RUGBY - ENGLAND

Works: STAFFORD · PRESTON · RUGBY · BRADFORD · LIVERPOOL

More than America spent to win its Independence

THE Revolutionary War lasted 8 years and its direct cost was $74,555,642.

This sum is considerably less than the amount Youngstown is spending on expansion--its share of the steel industry's program to help preserve America's 175-year-old freedom from Communistic attack.

Work on a $90,000,000 construction project at the Indiana Harbor Works, East Chicago, Indiana, is under way. It includes a 1500-ton blast furnace, 75 new coke ovens and 8 - 250 ton open hearth furnaces, heating furnaces, a high-lift blooming mill, with 6 - 3 hole recuperative soaking pits, ore dock extension, unloaders and ore bridge, and a vast array of other facilities needed to produce the additional 1,000,000 ingot tons of steel involved. By the end of 1952, the steel industry expansion program will raise the total steel producing capacity of the United States to over 117-million ingot tons. This is more steel than is made in all the rest of the world combined.

This tremendous investment by the shareholders of private industry is possible only with adequate profit--profit earned in the past and to be earned in the future. This is a symbol of public confidence--confidence that the American system of free enterprise is right *and worth saving.* Confidence that it will continue to be our way of life through the years ahead.

Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York
MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.

RECENT REFINERY VESSELS FROM GRAVER SHOPS

These pictures show the significant part Graver is taking in the modernization and expansion of the nation's refinery facilities.

1. Two sections of a Separator Surge Tank, 14′0″ x 35′2″
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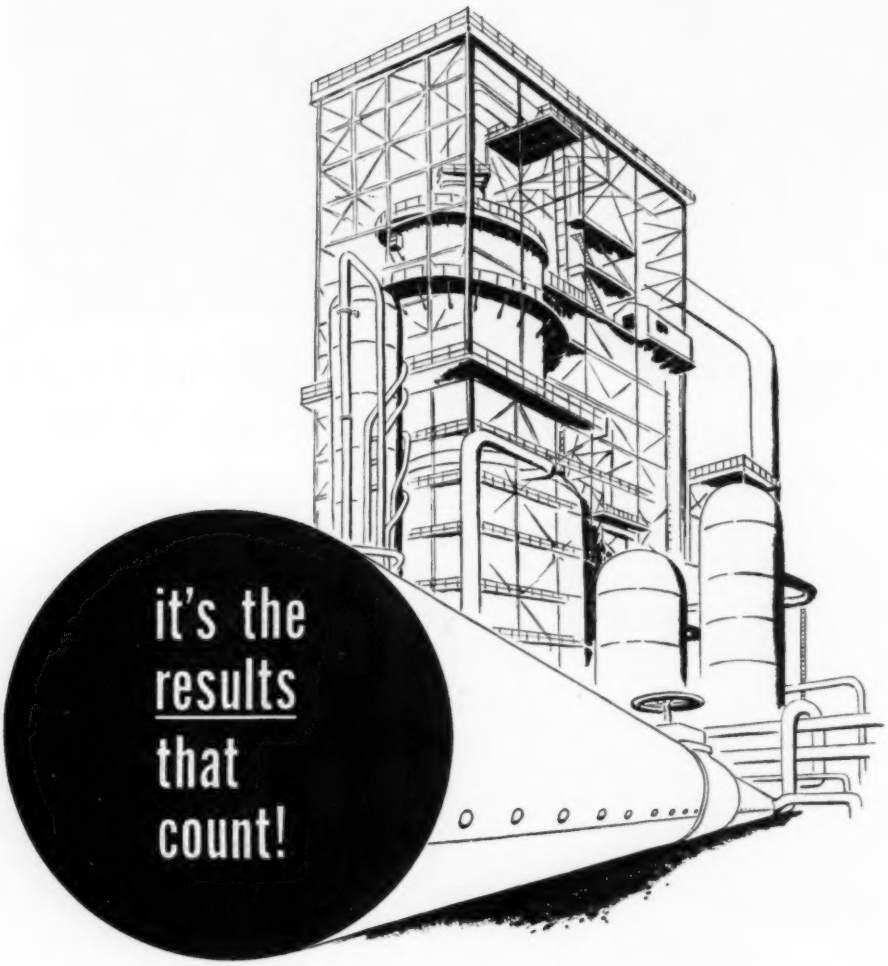

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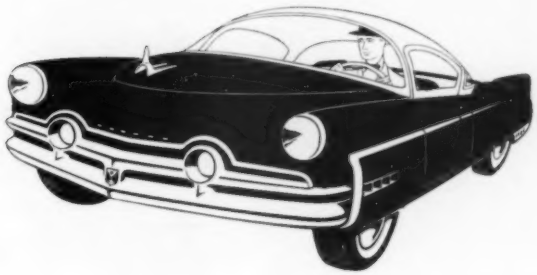

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WORLD PETROLEUM

The Management Publication of the International Petroleum Industry

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This Month's Cover

Earl J. Neff a young Cleveland artist produced the original water color for this month's cover. Mr. Neff is best known for his work as a muralist having decorated walls at the Cleveland Airport, Cleveland Public Library and the Engineers Building. The well pictured is an exploratory test, Plunkett No. 1, drilled by The Standard Oil Co. of Ohio, interests about 50 miles east of Saskatoon, Saskatchewan last September. Color plates are reproduced through the courtesy of Frances Kenney, editor of *The Sohioan*.

World Petroleum Index

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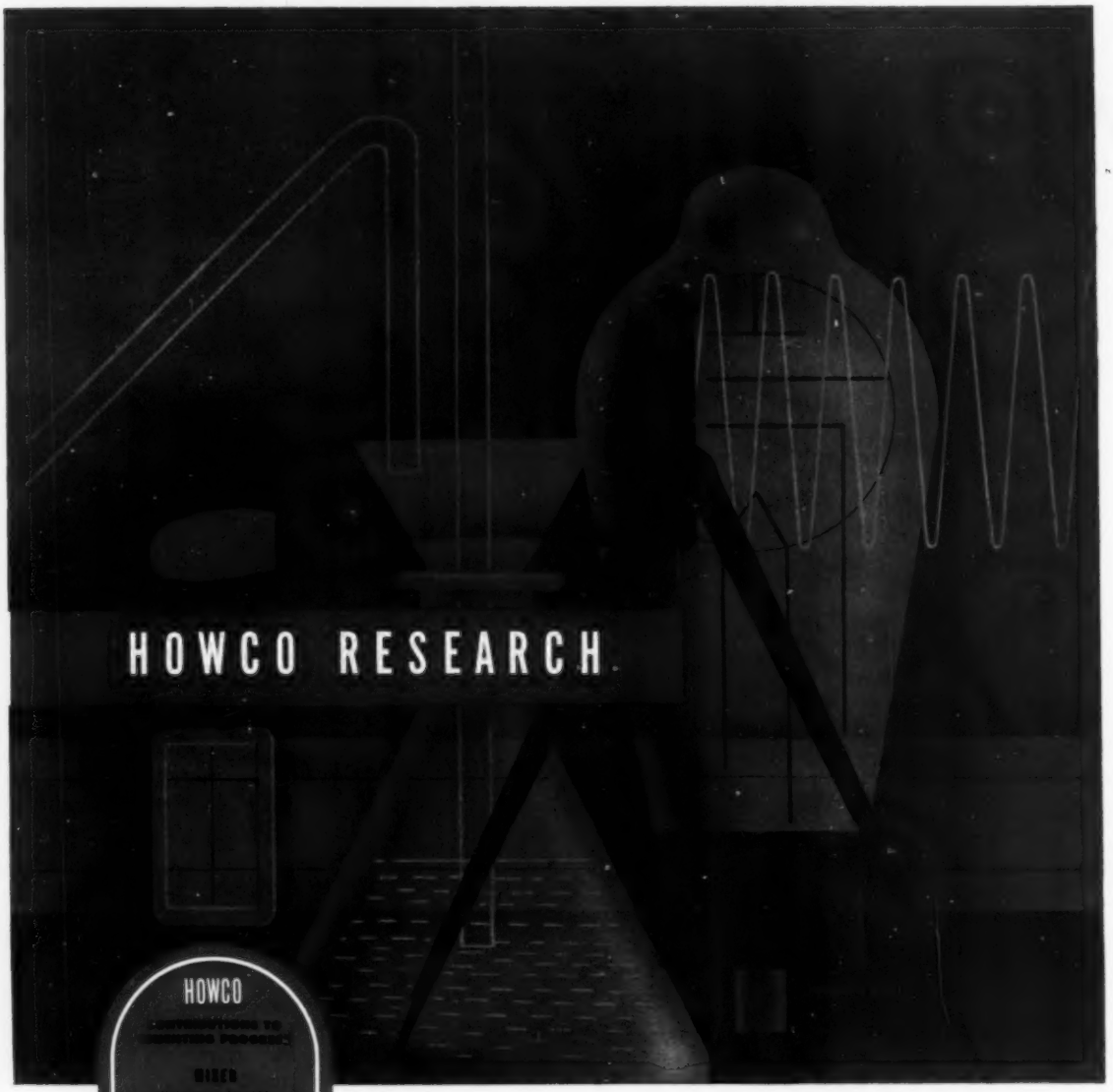

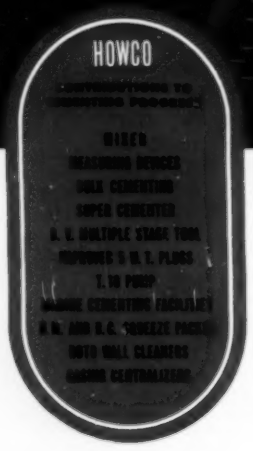

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Editorial

Canada's Place in the Oil World

IN the rapid—one might say indeed the spectacular—development of the Canadian oil industry during the past few years there is dual significance. First of all there is of course the tremendous impact which the growth of this now lusty infant is bound to have upon the industrial and economic life of Canada, an influence that is only just beginning to make itself felt.

To anyone who has seen the changes that have taken place in Alberta since the day in February 1947 when the Leduc discovery ushered in a new era it is easy to vision the transformation that is coming to that fortunate Province for the evidences already are beginning to appear. Its visible symbols will be a rapid increase in population, the swift growth of its cities, the industrial broadening which will come from the establishment of many kinds of manufacturing plants and the general prosperity inseparable from the opening of a great treasure house of hidden wealth.

The treasure is indeed too great to be confined to the use of a single province, even one destined for such a bright future as lies ahead of Alberta. The published estimates of reserves—upward of a thousand million barrels of oil and five trillion or more cubic feet of natural gas—necessarily relate only to those that are known to exist as a result of surveys and drilling that has been done. When one contemplates the relatively small dimensions of the era already explored, however, in comparison with the 800,000 square miles that make up the great sedimentary basin of western and northwestern Canada not even a geologist blessed with imagination, if such there be, will hazard a guess as to the quantity of liquid and gaseous fuel that may ultimately be recovered. He can only take refuge in pointing out that this region, still mainly unexplored, is larger than the combined area of the four leading oil producers of the United States—Texas, California, Louisiana and Oklahoma.

While the prairie provinces naturally feel that they have first claim upon the oil and gas within their own borders they are more than willing to share the surplus. Indeed, such sharing is necessary to their own prosperity for the growth of their industry would be stifled if it were to be limited to supplying local needs. Consequently the next step of immediate importance is the one that is now being taken of extending the lines of transportation to reach new markets.

For the current year Canada's requirements of petroleum products are estimated at roundly 350,000 barrels per day. It is figured that domestic production would be able to supply 200,000 barrels, if it could all be moved to markets able to use that amount. Because of lack of sufficient transportation the output of existing wells has been restricted to approximately half that quantity. The new pipe line which is the only important link with the outside world is capable of moving 95,000 barrels daily. Nearly half of that will go to feed refineries in Alberta, Saskatchewan and Manitoba, leaving 45,000 barrels more or less, to travel eastward down the Great Lakes to Ontario. Thus Canada will still face the necessity of importing the major part of its petroleum during the near future.

This is a temporary condition. Steps are being taken to enlarge the capacity of the Edmonton-Superior pipe line and plans have been proposed for other lines to extend both east and west from Alberta. Members of the Canadian oil industry are confident that the time is not far distant when the Dominion's great oil depository will be able to produce as much oil as Canada will require, even at its expected greatly increased rate of consumption. Whether or not it all goes to Dominion markets is another question.

Canada's prolific oil fields are nearer to some markets in the United States that are capable of using additional oil than they are to some of those within the Dominion. Since the two countries are separated only by an invisible line along the entire length of which there is no fortification or gun emplacement it would seem logical that Canadian oil should supply some portion of the western states while eastern Canada might continue to take part of its requirements through existing lines from the Mid-Continent. Both nations would benefit from provisions that would permit the movement of oil and gas across the border as future conditions might require. Canadians themselves are a bit shy about embracing this suggestion because of the agitation in the United States to discourage imports through quotas or higher tariffs and they fear action of that kind at some future date. Since it appears inevitable however that the United States, despite any increase that may reasonably be expected in production, will have to depend to some extent upon imports to satisfy its steadily rising demands it might very well draw some part of these requirements from its neighbor to the north which incidentally is its own best trade customer.

There is an added reason for such an arrangement. Recent events have emphasized the strategic importance of Canadian oil and the important part it would occupy in North American defense and particularly in defending the Pacific Coast in the event of a renewed world war. Military authorities of both countries have hailed the rise of the oil industry in western Canada because they recognize that it provides a bastion previously missing in the structure of continental security. Trouble, if trouble comes, is likely to make its approach from the north and west. The feverish and relatively futile attempts made in World War II to fill this gap attests the importance placed upon it by those in official positions who think in terms of strategy. Thus in peace or war Canada is certain to occupy an important place in the world oil picture.

International Significance Of Canadian Oil

By Hon. N. E. Tanner*

DAY by day it becomes more and more apparent that petroleum and petroleum products form the mainspring of modern civilization. In times of war, national safety depends upon adequate supplies of oil and no war can be brought to a successful conclusion without it.

In view of the present critical world situation, it is essential for Canada, as well as other members of the United Nations, to take stock of its oil position.

Up to now Canada has been dependent on other countries, mainly the United States and Venezuela, to provide eighty to ninety percent of its requirements. This situation will be alleviated to some extent when Lake Superior navigation opens in April or May of this year. At that time, Alberta crude oil will go by tanker from the storage terminal of the Interprovincial Pipe Line Co. at Superior to supply a large portion of the Ontario refining requirements and to that extent supplant United States crude from the Illinois and Mid-Continent fields.

Canadian requirements in 1951 are estimated at 348,000 barrels per day while potential domestic production is estimated at 200,000 barrels per day. This does not mean, however, that only 148,000 barrels per day have to be imported, the reason being that the economic problems connected with the transportation and distribution of Western Canada's potential output are still unsolved.

It is anticipated that Western Canada's production will be limited to an average of 123,000 barrels per day of which 38,000 barrels per day will be for the Ontario market and storage at Superior, the balance being utilized in Alberta, Saskatchewan and Manitoba.

It is interesting to note that due to the closing of navigation on Lake Superior for about five months, and seasonal demand variations, that actual daily production in Western Canada during 1951 will fluctuate from a low of 75,000 barrels per day in the winter to a peak of 143,500 barrels per day in the summer and fall.

The net result is that while Canada is capable of producing over 57 percent of its requirements in 1951, only 35.4 percent will actually be provided from domestic sources.

The outlook for 1952 is somewhat brighter. The Interprovincial Pipe Line Co. is planning to increase the capacity of its line by installing additional pumping units and to double storage capacity at the Superior terminal. This, together with completion of additional refining capacity on the prairies, should permit an average daily production of approximately 150,000 barrels or 39 percent of Canadian requirements, assuming a daily demand of 383,000 barrels. There is the further possibility of an additional market outlet through construction of a pipe line to the West Coast to supply British Columbia and northwestern United States. A line to supply the British Columbia market alone is not economically feasible due to the high cost of construction through the Rocky Mountains. Such a line if built would require a minimum throughput of 75,000 barrels per day (twice the British Columbia demand) to enable oil to be sold competitively on the Pacific coast.

Fortunately Canada has been able to rely on her friendly neighbor to the south, the United States, whose aims, aspirations and way of life are similar to our own, to supply a large portion of its oil deficiencies. The United States itself however has been a net importer of crude oil since 1946 and even with greatly increased domestic production a net importation of between 250 to 300 million barrels of crude oil is anticipated in 1951 to meet the domestic demand of over 2½ billion barrels.

It is to Canada and the United States that the free world looks for leadership in this present crisis. It is to them that other countries will look for the supply of much needed foodstuffs, raw materials, machinery, equipment and other industrial products. Without adequate supplies of oil for the farmer, the lumberman, the miner and the industrialist, this would not be possible.

The proving up of additional reserves, together with the production, transportation and distribution of oil, is one of the most important problems the United States and Canada have to face in order to make sufficient supplies of oil available to maintain their present productive capacity and be able to defend themselves should an emergency arise whereby supplies of oil from outside sources may be cut off or severely restricted. Canada must and is ready to do her part in maintaining self-sufficiency of production but only with the co-operation of the United States can the problem of efficient distribution be solved.

The great sedimentary basin in Western Canada, some 800,000 square miles in area, offers untold possibilities for the production of oil and gas. Oil reserves in Alberta, where most of the exploration and development have taken place, were approximately 1,100 million barrels at the beginning of 1951. When one considers the relatively small amount of exploration and drilling that has been done in this country as compared with the United States one realizes the enormous potential of Western Canada.

The spectacular yet orderly growth of the oil industry in Alberta is a result of the excellent working relationship between the government, which owns most of the oil rights, and the industry. The government believes in the competitive system of free enterprise but at the same time insists that the people of the province should share in the development of the oil resources and that they be developed in an orderly manner in accordance with sound conservation principles.

This growth has not been accomplished without the usual growing pains and the overcoming of numerous difficulties not the least of which have been the wide ranges of weather and climatic conditions experienced in this country. We were fortunate at the start of our rapidly expanding operations in having the benefit of the experience gained in the exploration for and production of oil in the United States and other countries.

The government set up a Petroleum and Natural Gas Conservation Board in 1938 patterned along the lines of the various regulatory bodies in the United States. The Board has functioned successfully and has gained the respect and confidence of both the industry and government. While it has utilized the experience gained in the United States and other countries in solving drilling, production and proration problems it has initiated new approaches and procedures of its own to meet varying conditions. The matter of obtaining experienced engineers, technicians and drilling personnel is one that has confronted the industry. This has now been largely overcome and a large working force of Canadians has been trained. The University of Alberta has established a course in petroleum engineering and the first class graduated in 1950. In addition the University is giving short courses in various subjects of interest to drilling and production crews which have proved very successful.

(Please turn to page 86)

*Minister of Mines and Minerals, Province of Alberta, Canada.

Pumping well at Bon Accord near Edmonton, Alberta. Photo courtesy Imperial Oil, Ltd.

Alberta's Greatest Year In Oil

By J. L. Irwin

THE year 1950 was Alberta's greatest oil year. This means that it was Canada's as well, for Alberta is the principal source of Canada's oil supplies.

This event was of course expected. The greatness does not come so much from the fact that a new production peak has been achieved which showed an increase of more than seven million barrels over 1949. This figure is deceptive and does not give a true picture. The saturation point of Alberta's available market was reached before 1950 even started. At the beginning of the year it was even wondered if so much of an increase would appear; not from inability to produce, but to sell.

Early in the year, however, the situation from a market standpoint began to change. It changed all over the world. Consumer demand was on the rise, and continued on the rise, so that Alberta's available market improved as a result of this.

In addition to field development, new discoveries and actual oil production, other factors came into being which helped to establish the greatness of this oil year. The Interprovincial Pipe Line from Edmonton to the Great Lakes was completed, the oil was turned into the line and the first barrels reached Superior, Wisconsin. Monster storage tanks were constructed at each end of the line, two great lake tankers were launched, new refineries were started and established ones were expanded. These and other important events all contributed to the oil industry's outstanding development of last year, the most notable in the province's oil history.

A factor which contributed considerably to Alberta's increased output was the filling of the pipe line and of the storage tanks at each end.

It is naturally a source of much pride to the citizens of Alberta that this province in the west is responsible almost entirely for the production of Canada's oil.

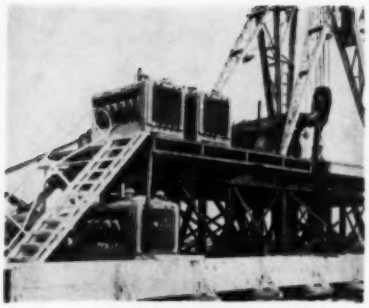
The first production in Canada came in 1858 in the Petrolia area of Ontario. It was the first year in the world's history when natural oil made its appearance. The world's first flowing well, the famous Drake well of Pennsylvania, came a year later, but the first pumper came a year before in Canada.

Oil activity in Canada continued in the east for about twenty years. At the turn of the century it moved to Alberta and has continued and grown in this province ever since.

From that time, to the Leduc discovery in February, 1947, this history of development records many interesting events. It is a story filled with drama, with successes and failures, with optimism and pessimism, and in the light of present day knowledge, with almost incredibly amusing incidents.

In 1906, for instance, Calgary, after years of fruitless search for natural gas to fill the city's requirements, at last manufactured artificial gas at considerable cost for construction of plants and mains and to consumers of the product.

In 1924, when the Turner Valley Royalite No. 4 well came in, discovery well of wet gas in the Madison limestone, there was much pessimism just prior to this successful completion, because the entry of the bit into the Madison was thought to be bad news, this



Portable drilling rig powered by diesels drilling Golden Spike No. 3. Photo by Harry Pollard for Caterpillar Tractor Co.

structure, according to previous experience, producing nothing but water.

Then followed the period of the old fashioned cable tool rigs, to be succeeded later by the first of the rotaries, which, though speedier, were less accurate. The earliest type was famous for crooked holes. There was no knowing just where the bit would go, or from whose property oil might eventually be recovered. Alberta has traveled far since then.

Through lack of adequate market, Alberta carried on from 1949 through 1950 on an oil production which was not only restricted to its allowable output, but often to a percentage of allowable production. In face of successes which were being established on all sides, it seemed something of a paradox to speak of the province's advance in oil.

It was realized of course on all sides that this condition was of a temporary nature. Nothing could be done about it until sufficient output by pipe line was provided to relieve the situation. This was being put into effect with amazing efficiency and speed.

The official total of Alberta crude production for 1950 is 27,149,318 barrels. To be added to this total are two others, 434,116 barrels of natural gasoline recovered from Turner Valley's absorption plants, and 15,022 barrels of by-products from the Leduc gas conservation plant. This made a grand total of 27,598,456 barrels for the year, valued at $82,178,925.

Value of the year's crude output was $80,568,178, the natural gasoline recovered in Turner Valley was valued at $1,558,035 and in Leduc at $52,712. Turner Valley's natural gasoline recovery is subdivided into recoveries from the Madison limestone and the shallow zone above the lime. The Madison provided 427,747 barrels of the total just given, and the shallow zone 6,369 barrels. The Leduc gas conservation plant by-products included propane and butane as well as natural gasoline.

The months of highest production were October with 2,875,457 barrels and November with 3,064,934 barrels, undoubtedly due to the opening of the Interprovincial Pipe Line on October 4.

As was to be expected, the performance of the Redwater field was the production high light of the year. It was not until December however that the cumulative production total of Redwater overtook that of Leduc. Redwater finished with a total of 10,746,472 barrels to compare with Leduc at 10,589,472 barrels.

Leduc's total was comprised of 160,060 barrels from the Lower Cretaceous zone, 2,872,559 from the D2 (Devonian), and 7,554,990 from the D3. Turner Valley's contribution was 3,771,754 barrels, made up of 3,113 barrels from the shallow zone above the Madison limestone, 3,340,894 from the Madison, and 434,116 barrels representing natural gasoline recoveries.

Lloydminster finished the year with a total of 809,801 barrels, and other fields with a total of 1,659,566 barrels. Under the heading of other fields, the three most outstanding had annual totals as follows: Golden Spike, about 18 miles to the west of Edmonton, 292,873 barrels; Excelsior, 12 miles north of Edmonton, 272,186; and Stettler, a 3-zone field, with Lower Cretaceous, D2 and D3, 246,198. The field to take fourth place was Joseph Lake, 22 miles due east of the Leduc field, which produced a total of 168,855 barrels. This field carries a special interest as until just lately it was the only area in Alberta to produce oil from the Upper Cretaceous, Viking sand. Production depth is around 3,300 feet. The second area to produce from this zone was the Barons No. 1 discovery well, which came in at a depth of 4,114 feet at the beginning of December. Two other most recent fields promise much for 1951. They are Acheson, which started only in September and finished the year with a cumulative total of 51,393 barrels in the Lower Cretaceous and D3; and Big Valley, also starting in September, which finished from the D2 and D3 zones with a cumulative total of 10,215 barrels. Acheson is about eight miles west of Edmonton and Big Valley is just south of the Stettler field, around 100 miles south of Edmonton.

Comparative production figures in barrels, 1950 and 1949, with 1949 totals shown in brackets, are as follows: Redwater 10,746,472 (4,793,491); Leduc 10,589,472 (9,688,784); Turner Valley 3,771,754 (4,304,063); Lloydminster 809,801 (716,941); other Alberta fields, 1,659,566 (743,187). The Lloydminster totals deal with production of the field on the Alberta side only.

Footage drilled in 1950, in comparison with 1949, the 1949 figures being shown in brackets is as follows: Redwater 1,536,440 (1,002,888), Leduc 1,030,667 (1,021,122), other fields 1,763,091 (1,188,606), total 4,330,198 (3,212,616). Cumulative footage totals, from 1914 to 1950 inclusive, are: Redwater 2,539,328; Leduc 3,072,982; other fields 10,884,278; total 16,496,588.

Wells capable of being operated on January 1, 1950, were as follows: Leduc 356, Redwater 271, Turner Valley 279, Lloydminster 86, other fields 92; total 1,084. On December 31, 1950, the figures were: Leduc 519, Redwater 726, Lloydminster 161, Turner Valley 328, Campbell 10, Excelsior 22, Golden Spike 6, Joseph Lake 26, Stettler 29, Whitemud 5, other fields and areas 155; total 1,987. By February 19, 1951, the total had increased to 2,104, producers in the four largest fields being Redwater 782, Leduc 553, Turner Valley 329 and Lloydminster 174.

The Leduc gas conservation plant, constructed by Imperial Oil Ltd. was another important development of 1950. Cost of this undertaking was five and a half million dollars. It was opened on May 12 by the Hon. N. E. Tanner, minister of mines and minerals of the Alberta government.

The principal object of this plant, as implied by its name, is the conservation of natural gas in the Leduc area. Construction was started in June 1949.

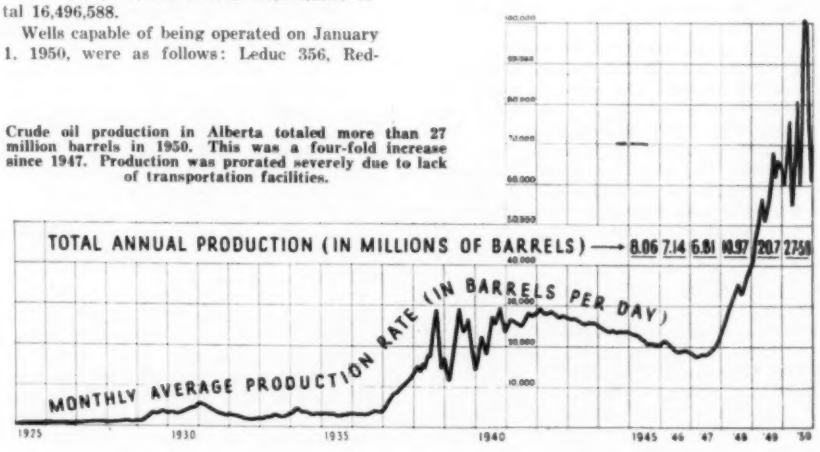
Designed ultimately to process 24 million cubic feet of gas daily, the initial capacity was in the neighborhood of 17 million cubic feet. Pending further field development and expansion of crude oil markets operations will be substantially below the plant's capacity.

Approximately 90 percent of the production will be dry gas which is to be used for domestic or commercial purposes. In full operation the unit will produce several hundred barrels per day of natural gasoline which will be suitable for blending with refinery stocks into motor gasolines.

Liquid petroleum gas or propane, extensively used as a domestic fuel in many areas, is also a by-product of the plant on a basis that will considerably increase the available supply in Western Canada.

A third by-product is butane, available to the commercial market as gas enrichment material, a solvent, or as special engine fuel.

Completion of the 1,127-mile pipe line from Edmonton to the Great Lakes, a gigantic undertaking made necessary by Alberta's surplus oil, was unquestionably the greatest event of last year for the Alberta oil industry. Oil was turned into the pipe on October 4 by the Hon. E. C. Manning, premier of Alberta. It had been finished within a time limit of 150 days despite a national railway strike, the worst floods in the history of southern Manitoba and frequent delays caused by bad weather. Its builders claimed for it the title



Crude oil production in Alberta totaled more than 27 million barrels in 1950. This was a four-fold increase since 1947. Production was prorated severely due to lack of transportation facilities.

of the "fastest" major pipe line ever put through. Longer and larger lines have been built but none on so short a work schedule.

With all this expansion there is still a great deal to be done. Alberta's daily production totals given by the Conservation Board's weekly reports move up and down according to demand. The week ending February 10 of the current year for example totaled 109,890 barrels daily. This was high. On frequent occasions, however, the total is around 100,000 barrels.

Canada's oil requirements at present are in the neighborhood of 350,000 barrels daily. These figures are growing steadily. At present allowables Alberta is contributing about a third of this. Alberta's production today can go higher than this figure and still be under official quotas.

Plans for enlarging the capacity of the Interprovincial Pipe Line already are under consideration and suggestions have been put forward for the building of other lines including one from Edmonton to Montreal. Such a line would have to be over 2,000 miles in length. It is not the most economic answer to the pressing problem, but G. L. Stewart, president of Imperial Oil Ltd. in an address to the Calgary Canadian Club last October stated that such a venture would be justified if other markets could not be developed.

A pipe line to the Pacific Coast has been proposed as a future possibility to supply markets in British Columbia and the northwestern United States. It would involve an expensive construction job through the Rocky Mountains plus considerable refinery expansion at the coast, and is not an immediate prospect unless an international crisis develops.

Among the world's refineries Canada takes second place as to the number of plants and fourth as to refinery capacity. New refineries are under construction in Alberta, Manitoba and Ontario and existing ones are being extended in Saskatchewan. Present daily refining capacity of Canada by provinces is given as follows: (figures in brackets show increased capacity underway) Nova Scotia 22,000 barrels; New Brunswick 300; Quebec 146,000; Ontario 87,000 (36,000); Manitoba 7,500 (10,000); Saskatchewan 35,000 (7,500); Alberta 52,000 (12,000); British Columbia 29,000; and Northwest Territories 1,250.

Despite the fact that production potential already exceeded demand from available markets 1950 was a year of activity in Alberta's oil fields. Redwater reached its second birthday in October. The field is approximately 26 miles to the northeast of Edmonton. Dimensions are now about 14 miles in length and four miles in width. By February 19, 1951 the total number of wells capable of production totaled 782. The total is expected to reach at least 1,000 eventually. The estimated reserve of the area is now placed at 700 to 800 million barrels and may reach one billion under further development.

Leduc, now four years old, continues to expand, especially in the southern area which has been greatly extended. It piled up an impressive total for 1950 of nine and a half million barrels which puts it second only to Redwater. A modern steel bridge across the Saskatchewan River is nearing completion. It will connect the Leduc and Woodbend fields. The cost of construction was placed at $250,000.

The decline of Turner Valley continues. The drop in production in 1950 was around half a million barrels. Repressuring is being carried out as heretofore and new compressors recently installed are doing good work. It is hoped that before long they will slow up the decline of this famous old field.

Last year brought improvement over 1949 for the Lloydminster field. Markets became more accessible in 1950; there was an increase in the price of black oil, and the demand for this product was considerably improved.

Lloydminster's production in 1950 for the combined field in Alberta and Saskatchewan totaled 1,896,180 barrels, 843,648 barrels for Alberta and 1,062,532 barrels for Saskatchewan. The cumulative production record from 1925 to 1950, gives Alberta 2,683,715 barrels and Saskatchewan 3,387,822, or 6,071,537 for the combined field.

Stettler, a 3-zone field, produced around a quarter of a million barrels in 1950. Big Valley, just to the south, a 2-zone area, started in September and looks promising. Acheson, just west of Edmonton, also started in September. So far it is 2-zone, Lower Cretaceous and D3. It totaled over 50,000 barrels in this short period. Campbell showed steady production through the year. With much acreage yet to be tested it should do well. Production is from the Lower Cretaceous. Excelsior steadily increased through 1950 and finished the year with over a quarter of a million barrels. Golden Spike almost reached 300,000 barrels with production steady. Joseph Lake, the first field in Alberta to produce oil from the Upper Cretaceous (Viking sand), increased through the year and finished with a total of around 170,000 barrels.

Last year saw the successful completion of Barons No. 1. The site of the well adjoins the town of Barons in Southern Alberta, 25 miles north of Lethbridge. Like Joseph Lake production is from the Viking sand. The pay zone interval was from 4,109 to 4,114 feet. By the end of January 1951 the well had produced 2,228 barrels of 32.5° gravity oil. To facilitate steady production at lower rates for conservation reasons, an electric power line was run to the well site and a pump installed. The operation necessitated the well being shut down until this was finished. Many analyses of the product show B. S. & W. at a tenth of one percent with no water. In other words, it is a clean oil.

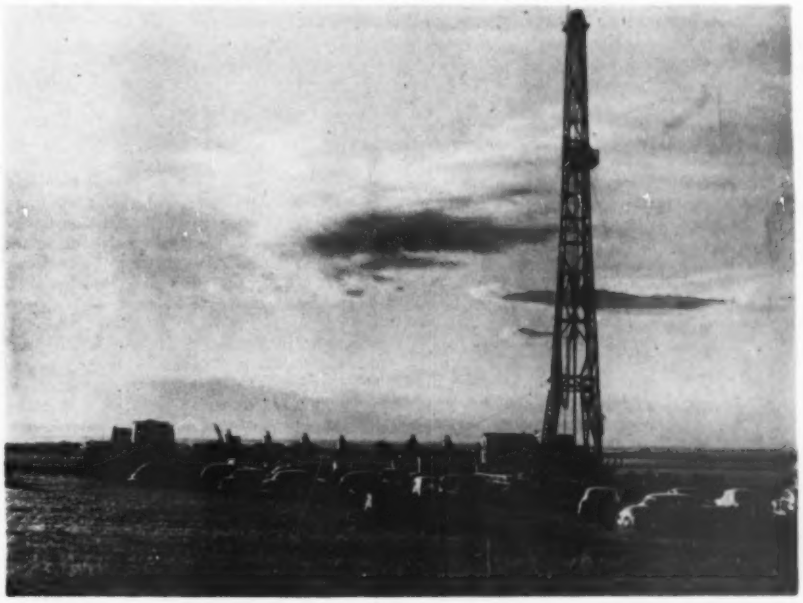
A detailed seismograph survey of the township is being completed by National Geophysical of Canada Ltd. before the reservation is converted to lease. A dozen or more Canadian and American companies are sharing the cost of this. A number of Canadian independents have applied for farm-outs of the Barons Oil Ltd. acreage.

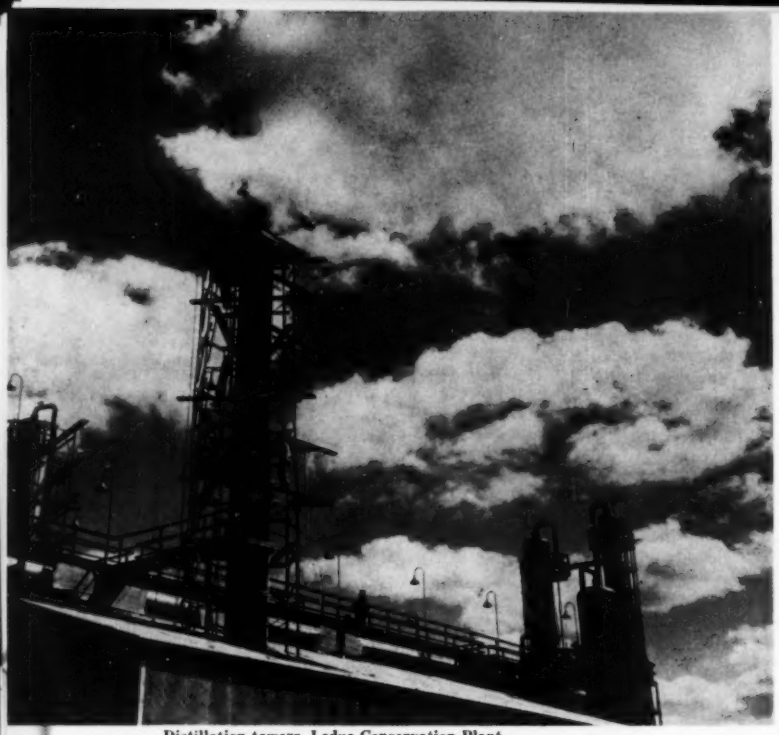
Barons No. 1 was brought in on December 3, 1950. The original 39,360-acre Crown reservation on which the well was drilled is owned by Don Oils Ltd. Barons Oil Ltd. will receive outright ownership of a nine section lease block around the well when reservation to lease has been effected. It will also receive one half of the remaining acreage converted to lease, Don Oils to hold the balance. The Alberta government will regain as Crown reserve one half of the 39,360-acre reservation

For all these reasons, the Barons discovery surrounded by the company's very considerable acreage, has become the subject of particular interest in Alberta's oil industry. Cunningham Craig, well known geologist of the early days of Turner Valley, was firm in his conviction that a major pool existed between the Montana border and the Valley.

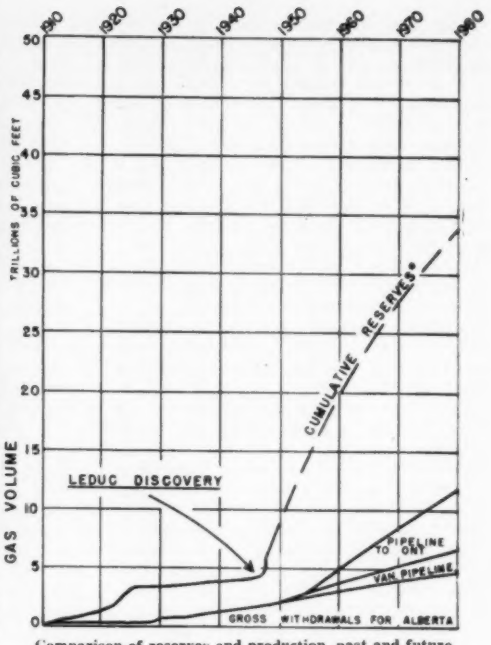
Would this be it? Evaluation of the field will give the answer. In any event, the nature of this particular discovery, with all its attendant favorable conditions, provides a fitting and appropriate close to the record of the eventful year of 1950.

Barons No. 1 discovery well spudding in on October 27, 1950 a mile east of the town of Barons, Alberta. Photo by Lloyd Knight, staff photographer of the Lethbridge Herald.





Distillation towers, Leduc Conservation Plant.



Comparison of reserves and production, past and future.
*Total discovered gas (used, wasted and remaining)

Gas fields of Alberta

The Gas Situation In Alberta

By A. W. Nauss*

IN Alberta, natural gas appears to be easier to find than oil. A much larger percentage of the wildcat wells in Alberta find commercial quantities of gas than find commercial quantities of oil. However, since the Alberta markets are already adequately supplied with natural gas, and as all other available markets for Alberta gas are so distantly located that only large blocks of reserves justify the building of pipe lines to those markets, the gas discoveries have not been developed as actively as have the oil discoveries. In spite of this situation, however, the oil and gas industry in Alberta has developed substantial reserves of gas in the few years since the discovery of Leduc.

The great impetus given to exploration as a result of the discovery of Leduc, and subsequent encouraging gas discoveries of the past few years, have attracted the attention of a number of financial interests to the possibility of building pipe lines from the Alberta reserves to the various markets lying to the west and to the east.

In order to gain permission to build a connecting pipe line between the gas reserves and the markets, a company must go through several steps. First, it must be incorporated under the laws of the Dominion of Canada by an act of Parliament. Second, it must obtain an export permit from the Alberta government which will allow it to remove natural gas from the Province of Alberta. Third, it must have its route and line approved by the Board of Transport Commissioners in Ottawa. Fourth, if the line plans to supply an American market, it must obtain permission to build

*Member of the firm of Link & Nauss, Ltd. Consultants on Oil Exploration and Development.

the American part of the line from the Federal Power Commission. After having gone through these four steps, the company is then in a position to finance and build the line, providing the gas reserves at the one end and the available market at the other end are sufficient to convince the financiers that the line is an economic venture.

The first gas well to be drilled in the Province of Alberta was at Pelican on the Athabaska River, several hundred miles north of Edmonton, in 1897. The well caught fire and burned for 21 years. Smaller shows of gas had been encountered in wells drilled as early as 1884, but this was the first large flow in what might be termed marketable quantities. Although shallow wells drilled in the Medicine Hat area found gas in 1904, the principal gas zone in this field was not tapped until four years later when a well drilled by the Canadian Pacific Railway company in 1908 marked the beginning of commercial gas production in Alberta. Development in the Medicine Hat area continued after 1908, and by 1914 some 20 producing wells had been drilled.

The Bow Island gas field was discovered in 1909. Between 1911 and 1921, the Canadian Western Natural Gas, Light, Heat and Power Company drilled 27 wells to serve a pipe line to Calgary. This pipe line was built before adequate reserves were developed to supply the city of Calgary, because the geologist on the job at that time had the theory that natural gas was of volcanic origin and that therefore the supply was unlimited. However, by 1927 this field was beginning to show signs of exhaustion, and since then has been used as a storage reservoir for Turner Valley gas.

The first gas well to be drilled in the Turner Valley field, 30 miles southwest of Calgary, was the Dingman No. 1 well drilled in 1913. In 1921, a gas line was laid from an absorption plant in Turner Valley to Okotoks, where it joined the Bow Island-Calgary gas line. However, the really large development of Turner Valley did not begin until 1924, when the Royalite No. 4 well was completed as a large gas condensate well in the Paleozoic limestone.

Dry gas was discovered in the Viking area some 150 miles east of Edmonton in 1914. Transportation to Edmonton by pipe line commenced in 1923, at which time there were only nine producing wells in the Viking field and insufficient proved reserves to justify the building of an 80-mile pipe line to the city. Fortunately, however, the nine producing wells in the Viking field proved to be only part of a huge field with sufficient gas to make possible the amortization of a very risky investment in the 80 miles of pipe.

Crude oil was discovered on the west flank of Turner Valley in 1936. Prior to this date, wet gas had been drawn from gas-cap wells for naphtha content and, as the gas produced was greatly in excess of market requirements, it is estimated that about one trillion cubic feet was wasted. Although the rapid depletion of the field was recognized as early as 1930, it was not until after the discovery of oil located lower structurally on the west flank that there was any marked decline in withdrawals of gas from the gas-cap. This reduction was effected partly by voluntary conservation and partly by measures enforced by the government's Conservation Board.

Between 1942 and 1946 the various oil companies operating in Alberta were becoming somewhat discouraged over the prospect of finding oil. Since their efforts had yielded greater success in finding gas, several of them decided to attempt a gas development sufficient to justify the building of a plant for the production of gasoline by the synthesis of the natural gas. The McColl-Frontenac and Union Oil companies of California undertook a program in the southeastern corner of Alberta, with the result that the Pendant D'Oreille, Manyberries, Black Butte and Smith Coulee dry gas fields were developed. In time, Imperial Oil Ltd. began drilling operations to the east of the Viking pool, where the gas-producing company had made no attempt to delineate the gas reserves. As a result, Imperial Oil Ltd. developed most of the reserves in the large Viking-Kinsella field, and in addition developed the new Provost field near the eastern boundary of the province. Similarly, California Standard embarked on an extensive drilling program in the Princess area where they succeeded in developing appreciable quantities of gas reserve. In addition, several smaller fields were developed farther to the south.

It is interesting to note that the activities of these companies, in an effort to establish sufficient gas reserves to justify a gasoline synthesis plant, mark the only conscientious effort that has ever been made in the province of Alberta to develop gas reserves. All other efforts have been directed toward the discovery of oil, and even the gas-producing companies in the province have made no notable effort to establish additional gas reserves.

Dr. A. W. Nauss, consultant in oil exploration and development.

The Leduc Gas Conservation Plant of Imperial Oil Limited.

In 1944, Shell Oil Company drilled its discovery well in the Jumping Pound field, a few miles to the west of Calgary. This field will be used to supply the city of Calgary as the production from the Turner Valley field declines below the requirements of the city. The pipe line from Jumping Pound to Calgary has been completed, and the scrubbing plant is nearing completion.

In 1947, Imperial Oil Ltd. made the discovery which started the oil boom in the province of Alberta. Since the oil is accompanied by a very large reserve of natural gas, Leduc was not only an important oil discovery, but also an important gas discovery. The success at Leduc touched off a very active exploration program which in intensity has been increasing steadily. The amount of exploration going on in Alberta at the present time is greater than it has ever been in the province's history.

In 1949, Gulf Oil Company found the huge Pincher Creek field in a fold disclosed by seismic methods in the foothills near the southern boundary of the province. Three wells have been drilled in this gas pool, and a fourth is now drilling. The reserves of this one pool are estimated to be in excess of one trillion cubic feet.

The most important recent gas discovery was made by Shell Oil Company on a farm-out from British American Oil Company at Whitelaw in the Peace River district, some 300 miles northwest of Edmonton. Gas was found in the Triassic at a depth of about 3,500 feet and extended through a thickness of over 500 feet with one intermediate zone of salt water. One offset well, drilled four miles to the southeast also encountered gas, thus making the area a promising one for the development of a large gas reserve.

Now that the Alberta government has definitely stated that the presently known reserves of the province are sufficient to supply its future needs, any gas which may be discovered and developed from now on can be considered as available for export. Therefore, particularly in view of the new regulations, the various companies interested in the export of natural gas will be encouraged to spend money on the development of new gas reserves. This, combined with the fact that exploration is at an all-time high, means that discovery of a large volume of gas reserves may be expected within two or three years.

In 1870 the Dominion government entered into an agreement with the Hudson's Bay Company whereby the Crown gained possession of the Northwest Territories, including the area now comprising the province of Alberta. The agreement provided that the Hudson's Bay Company would retain ownership of about five percent of the lands, including mineral rights, within the fertile belt of the territories. The area allocated to the Hudson's Bay Company was one and three-quarters sections in each township, namely Section 8 and three-quarters of Section 26. The Hudson's Bay Company still retains the petroleum and natural gas rights in about one and one-half million acres.

The Canadian Pacific Railway company and other railways also received land grants These grants for the most part comprised the odd-numbered sections, excepting Section 11 and 29, in each township in the area bounded on the north by the North Saskatchewan River. In the large irrigated areas of south-central Alberta between Calgary and Medicine Hat, however, the grant to the Canadian Pacific Railway consisted of all the lands excepting the Hudson Bay Company's quarters. Thus, in this area the Crown is not the holder of the mineral rights, and Canadian Pacific Railway still retains the oil and gas rights in approximately seven million acres. The Calgary and Edmonton Corporation and associated companies retain the petroleum and natural gas rights in about 1,300,000 acres.

Before 1887 homesteads and purchases from the Dominion government included both mineral and surface rights. As the mineral rights were not included with grants after 1887, the Crown retained the ownership under large areas. In 1930, ownership of the natural resources within provincial boundary passed from the Dominion to the province of Alberta. Alberta thus has a total area of 163,382,400 acres. Ownership of the mineral rights in this acreage is divided as follows: Dominion parks reserved to the Dominion government, approximately 8.2 percent; Indian reservations reserved to the Dominion government, approximately eight-tenths percent; held in freehold including railroad grants, approximately ten percent; mineral rights held by the province of Alberta, approximately 81 percent. Much of the above land has now been leased to the various oil companies operating in the province.

The Alberta government makes Crown lands available to the oil companies in the form of a reservation. An oil company may take as many as two reservations, each of which may have a maximum area of 100,000 acres. During the first year, sufficient exploratory work must be conducted upon the reservation to convince the Department of Mines and Minerals that an honest effort is being made to find either oil or gas. Rentals commence at the end of one year, and are gradually increased to a maximum of one dollar per acre. The initial cost of acquiring this acreage is $12,750 for a 100,000-acre reservation, which includes deposit and filing fee. If oil is discovered upon the reservation, the oil company may take up to one-half of the area of the reservation in the form of a lease, the balance reverting back to the Crown as reserve. The lease has a term of twenty-one years, or as long as oil is produced from the land. During the term of the lease the company must pay the yearly rental of one dollar per acre.

Early in 1951, the government of Alberta passed new regulations in connection with natural gas. Discovery of natural gas in a wildcat well on a reservation does not compel the operator to return one-half of the acreage to the Crown. Upon payment of a fee of $250, a natural gas license may be taken out for the gas reservoir involved. The gas license covers the entire area of the reservation, and while in effect, the operator is required to conduct an almost continuous drilling program. Upon completion of this program, the company may take out gas leases which give the operator rights in the gas reservoir only. The entire 100,000 acres may be taken out as a gas lease providing that sufficient successful gas wells have been drilled. The amount of land which may be taken out under lease around each well depends upon the depth of the well, the minimum block being six sections for wells of less than 4,000 feet in depth. If a market is not available for the natural gas, the operator must pay the rental of ten cents per acre per year on such leases. However, if a market is available for his gas, he must pay a rental prescribed by the Department of Mines & Minerals.

Table 1

Estimated by:	Disposable Gas in Billions of Cubic Feet
Westcoast Transmission Co.	7,023 (1)
Northwest Natural Gas Co.	5,006 (2)
Prairie Pipelines	4,684 (3)
Western Pipelines	5,614 (4)
McColl-Frontenac & Union Oil	6,284 (5)
Leisemer	3,635 (6)

(1) Includes 90 billion beyond economic reach, entire province.
(2) Eleven fields, excluding Medicine Hat and other local reserves.
(3) Nine fields of over 50 billion cubic feet each.
(4) Estimate for entire province includes reserves beyond economic reach.
(5) Includes 660 billion beyond economic reach, entire province.
(6) Includes 191 billion beyond economic reach, entire province, but excludes reserves less than 20 billion and certain ones beyond economic reach.

A summary of the various estimates presented at hearing held over the past year before the Petroleum and Natural Gas Conservation Board in Calgary, is shown in Table I.

As a comparison, the Conservation Board's estimate of reserves of disposable gas in the province, including 19 billion cubic feet beyond economic reach and excluding certain small reserves of less than five billion cubic feet, is 4,658 billion cubic feet.

During 1948, the Canadian Geological Survey made an investigation into the natural gas reserves of the Prairie provinces. The final report was presented on November 30, 1948. This work was done by Dr. G. S. Hume and A. Ignatieff. Their estimate of the recoverable reserves of Alberta was 4,272 billion cubic feet. In 1950, Dr. Hume again studied the reserves of the province of Alberta and presented a report dated July, 1950. His estimate of the reserves, calculated on the same basis, was 6,365 billion cubic feet.

From the table it can be seen that the various gas estimates vary from a low of 3,635 billion cubic feet made by Mr. Leisemer, to a high of 7,023 billion cubic feet made by Westcoast Transmission Company. Table II is a list of some of the more reliable estimates selected out of the numerous estimates given for various pools. The figure given is an average. It is neither the most optimistic of the figures given, nor is it the most pessimistic.

In addition to the fields listed and included in the above figure of 5,907 billion cubic feet, there are numerous drill-stem tests and shows which have not been included, indicating that the reserves can readily be increased to a substantially higher figure. Of particular importance is the Whitelaw field. Only the reserves immediately surrounding the Whitelaw well have been included in

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Royalite gasoline plant and laboratories.

The Outlook for Gas Export for Alberta

By Dr. Theo A. Link

FOR the past two years hearings have been conducted in the province of Alberta with the object in view of ascertaining how much natural gas is available in that province, how much will be needed to take care of the anticipated demand for the next 30 years within that province, and how much, if any, could be dedicated for export to other provinces or to the big neighbor to the south without jeopardizing the well-being and comfort of several generations in Alberta. In other words, those in control in Alberta believe in the motto "Charity Begins at Home."

The hearings began with the "Dinning Commission," prior to which the Dominion government in Ottawa had assigned to Dr. G. S. Hume the task of calculating and estimating the recoverable reserves of natural gas available in Western Canada. At the time when the Dinning Commission began its hearings the general public, and that Commission had very little grasp of the meaning of reserve estimates as submitted by engineers and geologists, and even today the majority of people have very little conception what one thousand cubic feet of natural gas actually represents, to say nothing of what a trillion cubic feet mean, and what can be done with that amount. . . . However, I might be able to convey that roughly by stating that during severe winter months the consumption of natural gas per day in Calgary, Alberta (a city of some 125,000 souls), is over 100 million cubic feet, and if that consumption were maintained throughout the year it would amount to 36 billion, 500 million cubic feet per year. At that rate one trillion cubic feet would last a little more than 27 years. In other words, one trillion cubic feet of reserves would last 27 years at a consumption rate of 100 million cubic feet per day. Since the year-round average load for Calgary actually averages 56.5 million cubic feet per day, one trillion cubic feet would be sufficient to keep Calgary going for some 48 years, at the present rate of consumption. It is to be noted here that in Calgary very little coal or fuel oil is used for domestic and industrial purposes, and that these figures indicate what natural gas, essentially by itself, means to that city. . . .

After listening to submittals by several companies, together with the various estimates with respect to the probable increased local demand for natural gas in Alberta, the Conservation Board decided to make its own calculations and estimates of proven reserves and probable demand. The Board's estimate of reserves was recently submitted as 4,658 billion (or 4.7 trillion) cubic feet. This is lower than any estimates for total reserves submitted by any of the companies. The probable future demand for gas in Alberta, as calculated by the Board, was also higher than any of those submitted by the various export-seeking companies. It is obvious that the Conservation Board was taking no chances whatever.

Putting the low reserve estimate together with the high future demand estimate, the Board concluded that there were 30 year's supply on hand, and then recommended that the industry go ahead and look for more gas, and then if, as, and when sufficient gas has been discovered, in and above the reserves as now estimated by the Board, applications would be entertained for export purposes. One item in the Conservation Board recommendations of considerable interest was the setting of the 30 years proven reserves rather than 50 years as advocated by some of the Alberta gas distributing companies. It was recommended that those who were selling gas in Alberta now did not have a right to insist upon an almost indefinite supply, particularly if no effort on their part was being made to discover new reserves, or to enlarge their present known ones. I agree with this since no progressive oil or gas company can afford to stand still when dealing with a dwindling resource or asset, nor can any self-respecting citizen expect to pay the same price for gas in the year 2000 as he is doing today.

If all rules and regulations with respect to natural gas permits and leases were left as they had been prior to the Conservation Board's recent submittal, the gas export possibilities would not look favorable for the immediate future. However, the Alberta government passed a new order on Council, on the heels of the Conservation Board's recommendations and report, altering the natural gas permit and lease regulations so that they are now more workable and fair. They now give an incentive for exploration and development of gas reserves. This latter move, rather than the Board's findings with respect to reserves, is the main reason for hope that gas export is a thing for the very near future.

Wildcat and step-out wells will now be drilled in Alberta not only for oil, but also for gas, and my forecast of January, 1949, wherein it was anticipated that 10 trillion cubic feet of gas reserves would be found within the next five years (i.e., 1949-1954) will probably prove to be a gross understatement in spite of the fact that at that time some labelled it as dreaming. My prognostication at that time was made on the following assumptions: (a) That Dr. Hume's figures which were then 4,261 billion (or 4.3 trillion) cubic feet of recoverable reserves were reasonably correct; (b) That the tempo of exploration for oil would be maintained; (c) That undiscovered gas reserves bear a rough relationship to crude oil reserves discovered and to be discovered, and (d) That the geological column and size of the area of the western Canada sedimentary basin area is such that the possibilities of important new reserve discoveries are most encouraging. This latter statement is based upon the fact that there are a minimum of 14 different horizons in the rocks of eight different geological periods of Western Canada in which gas has already been discovered at various localities. They are as follows:

Dr. Theo. A. Link

Upper Cretaceous (3 horizons)

(1) In southern Alberta many ranchers produce both water and gas at very shallow depths from the Milk River sandstone of Upper Cretaceous age.

(2) Throughout the Plains of Alberta gas reserves have been established and production is being taken from the Viking sandstone which is also termed the Bow Island or Pelican Sand.

(3) In the Princess-Steveville area gas has been discovered in a sand at the base of Upper Cretaceous.

Lower Cretaceous (3 horizons)

(4) In north, central and the southern part of the Plains area of Alberta there are three different gas horizons in sands of Lower Cretaceous age.

Triassic (1 horizon)

(5) In the Peace River area gas has recently been discovered in rocks of Triassic age.

Jurassic (1 horizon)

(6) In the Southern Alberta Plains and Turner Valley gas is produced from sands of Jurassic age.

Pennsylvanian (1 horizon)

(7) In the Peace River area sand and dolomites of Pennsylvanian age have been found to contain large volumes of gas.

Mississippian (1 horizon)

(8) In Turner Valley, Pincher Creek, Jumping Pound, and also in the Plains area, the dolomites of Upper Mississippian age contain large natural gas reserves.

Devonian (3 horizons)

(9) Three different horizons of Devonian age yield gas in the Edmonton area.

Cambrian (1 horizon)

(10) In the foothills area gas has been discovered in dolomites of Cambrian age.

On top of all that there is gas issuing from the ground in the form of seepages in many parts of Alberta, and so it can be said that

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* Extracted from a paper presented at the annual meetings of the Prospectors and Developers Association and the Geological Association of Canada, March 4, 1951.

Completion Of Interprovincial Line Gives Prairie Oil A Needed Outlet

Dr. O. B. Hopkins, president, Interprovincial Pipe Line Co.

Thomas S. Johnston, vice president.

L. F. Kahle, executive vice president.

R. E. Trammell, general manager.

LINKING the prolific oil fields of Alberta with the outside world and giving their output access to markets well beyond provincial boundaries the completion of the Interprovincial Pipe Line marks an important milestone for the petroleum industry of western Canada. The building of the 1,127 mile line was in itself an epic story of speed and efficiency, construction being accomplished between May of 1950 and October 4 following when the first section was formally opened to operation, a period of slightly less than six months. The work of construction was divided into three sections. The first, 438 miles in length, extended from Edmonton, Alberta, to Regina, Saskatchewan. It was built by Canadian Bechtel, Inc., associated with Fred Mannix & Co. Ltd. of Calgary. The second section, constructed by Williams Bros. Company of Tulsa, carried the line 336 miles further, to Gretna, Manitoba. The third division, 324 miles, lying within the United States and terminating at Superior, Wisconsin, was the work of Anderson Bros. of Houston, Texas.

First section of the line, from Edmonton to Regina, is equipped with pipe of 20-inch diameter. The portion between Regina and Gretna consists of 16-inch pipe and the Gretna-Superior division has 18-inch pipe. At its Edmonton end the main trunk is connected with feeder lines from the Redwater and Leduc fields. Designed capacity of this western segment of the main line is 95,000 barrels daily and that of the eastern portion is 70,000 barrels.

Construction of this line was described in an earlier article in this magazine.* The completed system is patrolled throughout its length once a week or oftener by aircraft equipped with two-way radio for communication between plane and stations.

Six pumping stations provide for the movement of oil through the line. These are located at Edmonton, Alberta; Kerrobert, Saskatchewan; Regina, Saskatchewan; Cromer, Manitoba; Gretna, Manitoba, and Clearbrook, Minnesota. Six additional stations, four in Canada and two in the United States, are planned for construction during the coming year to increase the capacity of the line. Each of the Canadian stations now in operation is powered by four Alco engines, those at Edmonton and Kerrobert being 8-cylinder turbo-charged, those at Regina and Cromer being 6-cylinder turbo-charged and those at Gretna being 6-cylinder normal aspirated. The station at Clearbrook, Minnesota, has three 6-cylinder turbo-charged engines. These were built in the United States by American Locomotive Co. while those in the other stations were supplied by the company's Canadian affiliate.

With the exception of the Edmonton station the engines operate on crude taken from the line. At Edmonton a dual fuel feature has been incorporated enabling the engines to operate on crude and natural gas. All engines are cooled by jacket water to crude exchangers and are equipped with waste heat boilers for heating the stations. The stations are also provided with auxiliary boilers.

Station pumps are single stage centrifugal units. Canadian stations are equipped with

*See WORLD PETROLEUM, July, 1950.

Welding pipe on the Edmonton-Great Lakes line.

Byron Jackson pumps, manufactured by Canada Iron Foundries. In the United States Bingham pumps are installed. Pump dimensions are 8 x 10 x 16" on the 20-inch section of the line from Edmonton to Regina, 8 x 10 x 14" on the 16-inch section from Regina to Gretna and 8 x 10 x 16" on the 18-inch section from Gretna to Superior.

Speed increasers with a ratio of six to one are employed and these were manufactured by Dominion Engineering Works for Canadian stations and by Farrel Birmingham for the United States.

While the primary objective in building Interprovincial was to deliver Alberta oil to deep water on Lake Superior for tanker transport to refineries in eastern Canada and this will not be attained until the opening of navigation about mid-April the line also delivers crude to several refineries along its way. This it has been doing while operating at part capacity during the past several months. The preliminary pumping schedule that has been in effect provides for the movement of approximately 42,500 barrels daily out of Edmonton. Take-offs from this stream supply 7,500 barrels to the Moose Jaw refinery of British American, 17,200 barrels at Regina for the refineries of Imperial Oil and the Co-operative Refinery Association, 1,600 barrels at Souris Junction for Anglo-Canadian and 4,200 barrels at Gretna for transmission via the Winnipeg Pipe Line Co. to the North Star Refinery at Winnipeg. The remaining 12,000 barrels daily has been moving to storage at Superior.

With tanker movement out of Superior in operation 95,000 barrels daily will begin moving out of Edmonton with 65,000 barrels continuing eastward from Regina and 50,000 from Gretna to Superior.

Ample storage facilities are an important factor in Interprovincial's operations. Tankage constructed or being completed along the line includes the following:

Location	Tanks	Capacity Each in Barrels
Redwater	2	96,000
Edmonton	6	140,000
Stony Beach (Moose Jaw Junction)	2	24,000
Regina	2	56,000
	1	140,000
Gretna	3	56,000
Souris (Brandon)	2	14,000
Superior	12	150,000

This adds up to 3,328,000 barrels

The company intends to add twelve more tanks of 217,000 barrels each during 1951 to its storage equipment at Superior which will bring total capacity at that point up to 4,400,000 barrels.

Loading facilities at the Superior terminal provide for delivery of fuel cargo to a 115,000-barrel tanker in approximately eight hours.

The speed and efficiency with which the Interprovincial line has been completed is a tribute to its planners and builders. Its construction, together with the provisions for later enlargement of capacity, is the most important progressive step that has been taken since the development of the western fields began. It undoubtedly is the forerunner of other lines that will carry the oil and gas of the prairie provinces both east and west and enable them to take the important place in the world oil situation that their great resources justify.

Largest Fresh Water Tankers Will Move Alberta Oil

WHEN the first of Canada's big tankers leaves her berth at Lakehead and turns her bow eastward down the Great Lakes the oil producers of the west will feel that they have passed a notable milestone in the progress of Canadian oil toward a place of importance in the international industry. Heretofore, in spite of rising production, the discovery of new fields and the building of refineries, western oil has been circumscribed within the confines of local markets by a lack of transport facilities. The establishment of this link with a broader field undoubtedly will be followed by other land and water lines that will take the oil and gas of Canada far beyond their present limits.

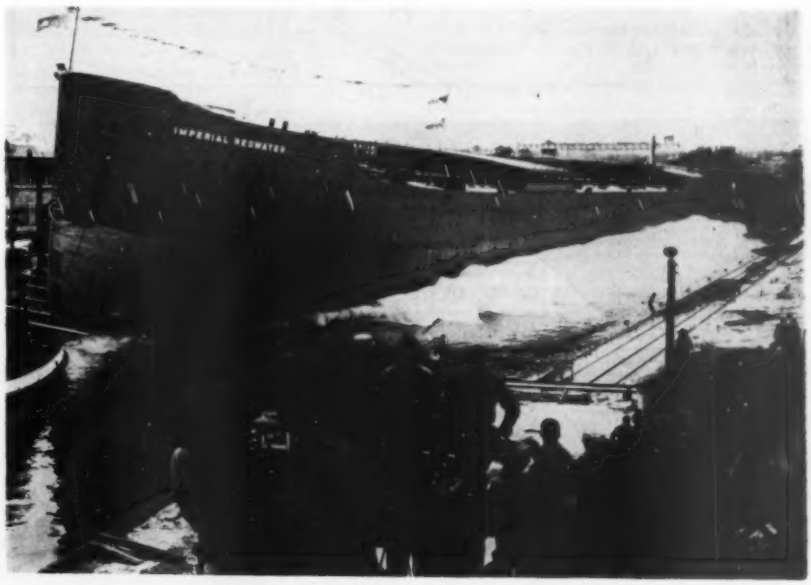
It is true of course that without the pipe line delivery of oil at deep water there would have been no immediate need for tankers of such size, but it is equally true that without the possibility of relatively low cost water transport for the longer voyage the pipe line would not have been laid at this time. The two are components of a system that under further development will extend the marketing area of Canada's oil far beyond its present confines.

The two tankers which are to inaugurate the transport of the oil of Leduc and Redwater to eastern Canada were built especially for this service. With a length of 620 feet, a 68-foot beam and a draught when loaded of 24-feet they are said to be the largest ever built for fresh water navigation. They are twins in design, each with a speed of 13 knots and a cargo capacity of 115,000 barrels. They are expected to make the round trip between Superior and Sarnia which will enable them to transport about five million barrels each in a season of normal duration.

The tankers are equipped with all modern safety appliances and aids to navigation including fire fighting apparatus, radar, gyro, fathometers, direction finders and ship-to-shore radio. Attractive quarters are provided for officers and crew of 36. Staterooms are arranged for occupation by not more than two persons each and there are well equipped recreation rooms for off-duty use.

The tankers were built by Pipe Line Tankers Ltd., one at Collingwood and the other at Port Arthur. They are named "Imperial Leduc" and "Imperial Redwater" after two of Alberta's well known oilfields. "Imperial Leduc" was launched last November with Mrs. N. E. Tanner, wife of Alberta's Minister of Mines and Minerals as sponsor. "Imperial Redwater" was launched a little later in the same month under the sponsorship of Mrs. C. D. Howe, wife of Dominion Minister of Trade and Commerce. Both vessels have been leased to Imperial Oil Ltd. for a period of ten years.

In January last it was announced that a third tanker, similar in all respects to her two predecessors, would be built at Collingwood Shipyards for delivery in the spring of 1952. Cost of each vessel is about $4,000,000.



Launching of "Imperial Redwater" at Port Arthur, Ontario.

Canada Adopts Latest Advances in Refining Processes

CANADIAN refinery capacity has increased 20,000-barrels per day each year in the post-war period.

Within the past five years crude oil capacity of Canadian refineries has increased 47.5 percent to 351,550 barrels per day. At the same time cracking capacity has increased 55 percent to 161,430 barrels daily.

Building projects now under way will add 26,300 barrels of crude capacity and 17,344 barrels of cracking capacity to Dominion refineries this year. By the end of 1952 an additional increase in crude capacity of 35,000 barrels daily will have been completed on the basis of announcements already made. Cracking capacity will be enlarged by at least 45,000 barrels daily by the erection of three very large catalytic cracking units.

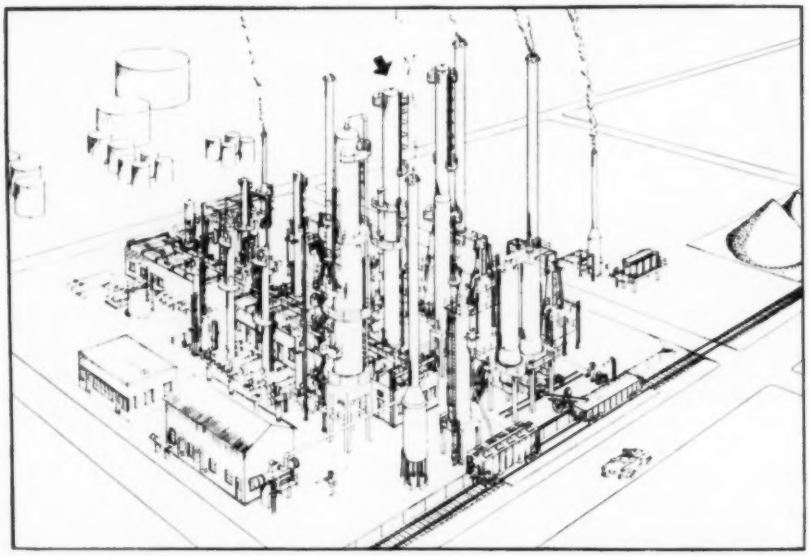
Crude charging capacity of Canadian plants by the end of 1952 will exceed 400,000 barrels daily. If demand for petroleum products continues to grow in the Dominion at the rate experienced since the close of World War II the capacity as planned today will not do more than keep pace with consumption. Expansion in recent years has been roughly parallel to the rate of market growth.

Capital requirements for keeping Canadian refineries abreast of product consumption is putting a heavy load on the industry. Cost of the plants going on stream this year will be in excess of $25 million and in 1952 the cost of new plants thus far announced will be $37 million. In the past five years since the close of the war the industry has invested more than $100 million in new refining facilities in addition to the very substantial sums required to find new crude supplies in the west and create transportation facilities to deliver products to market.

Post-war refinery construction activity in Canada has fallen into three general phases. The primary program involved the enlargement and modernization of refineries in the east which draw their crude through the Portland-Montreal pipe line and from tankers sailing up the St. Lawrence. Four major companies added 77,000 barrels of crude capacity at Montreal.

Second phase of the building program was begun in the prairie provinces as soon as it became apparent that very large new crude reserves had been uncovered. Whereas the Quebec refining program is now complete, at least for the present, the prairie program is in full swing. Current projects will be well on their way to completion by the end of 1951.

The third phase of the program involves the building up of more adequate capacity in the Ontario region. Here Canadian Oil Re-



Perspective drawing of new British-American combination crude and cracking unit. Arrow points to bubble tower which handles effluent from both the thermal cracker and the delayed coker as well as light cycle oil from the fluid cat cracker.

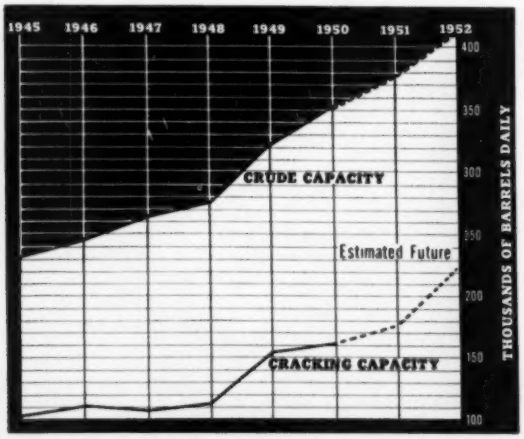
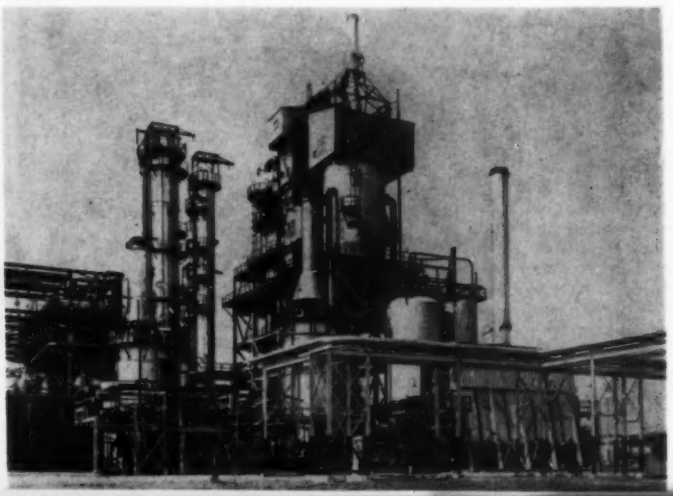


Chart showing extent of recent growth in crude and cracking capacity of Canadian refineries with indicated capacity at end of 1952.



Fluid catalytic cracking unit at Montreal works of McColl-Frontenac Oil Co. Ltd.

fineries Ltd. has begun work on an $18 million plant which will be able to process 20,000 barrels of crude daily and Imperial Oil Ltd. has announced a modernization and enlargement project for its Sarnia plant which will cost another $14 million and add 15,500 barrels to crude capacity. Ontario plants formerly drew their raw material from United States fields by pipe line. Completion of the Interprovincial line to Superior permitting delivery of prairie province crude to Great Lakes tankers is the principal stimulus behind the current building program in Ontario.

At the close of the war the location of Canadian refineries was rather more in relation to availability of crude than to volume of near-by sales. This situation is being minimized today.

In 1945 the prairie provinces were consuming 29.7 percent of all gasoline sold in the Dominion but had only 17.6 percent of the crude still capacity. Quebec and the Maritimes with 26 percent of the Dominion demand had 40.6 percent of the crude capacity and an even greater proportion of cracking still capacity. Ontario was nearly in line with demand with 35.4 percent of gasoline consumption and 32.7 percent of refining capacity.

By the close of 1951 refining capacity in the prairie provinces will have increased 150 percent as compared with 1945. Plants in the area will have a crude capacity of about 113,000 barrels daily or roughly 28 percent of Dominion capacity after present building programs are complete. This percentage of capacity will be close to the current percentage of gasoline demand in the prairie provinces.

Growth of demand for gasoline in various parts of the Dominion has been fairly uniform in the past six years. Ontario has tended to use a somewhat higher proportion of the country's total gasoline. In the first 11 months of 1950 motor gasoline sales in Ontario constituted 37 percent of total Dominion sales compared with 35.4 percent in 1945. Quebec consumption also was up slightly and all others off a bit. Figures for the two isolated periods are not conclusive, however, as establishing a trend.

A feature of the post-war construction in Canada has been the very large group of catalytic cracking installations. Virtually every project undertaken in the past three years has included a feed preparation unit and a cat cracker of sufficient capacity to process all or virtually all of the middle distillates which will become available. A few examples will illustrate. The new McColl-Frontenac refinery at Edmonton will have a crude capacity of 5,500 barrels daily and a cat cracker large enough to process 2,644 barrels of fresh feed per day. A coking unit will be employed to increase available cracking stock. Imperial Oil's Edmonton refinery with a crude capacity of 20,700 barrels will have a 10,000-barrel cat cracker and its Winnipeg plant with 10,800 barrels crude capacity will have a cat cracker capable of running 3,750 barrels daily.

Some of the new cracking plants are employing new technical developments which will be of interest to refiners in other countries.

The first of the new, greatly improved and simplified type of fluid catalytic cracking unit, known as Model IV, will be built by Foster Wheeler Ltd., at Imperial Oil Company's Edmonton refinery. The Model IV is the result of several years of intensive research and development by Standard Oil Development Co. New features made possible an over-all simplification and rationalization of catalytic cracking units, as well as a substantial reduction in total costs.

The design alters the traditional outline of the catalytic cracker that has been a familiar sight in the past few years in the refinery silhouette. The "cat" cracker is no longer a towering structure, dominating the whole landscape. Model IV is smaller, close to the ground, and the highest points of the two main vessels are less than 100 feet above ground for the 10,000 barrel per day unit of Imperial.

Details of design features of Model IV not released at the present time include several major changes in processing methods. The development has been undergoing extensive testing in the past few years in commercial refinery operation.

What is said to be the world's most advanced example of combination processing is currently being erected for the British American Oil Co. Ltd. at Edmonton, by the Canadian Kellogg Co. Ltd., according to the designers, The M. W. Kellogg Co. The refinery is a complete combination plant operating off one central control room. Processing equipment includes crude distillation, delayed coking, thermal and fluid catalytic cracking, gasoline stabilizing, light ends fractionating and light oils treating.

Key to the processing sequence, according to Kellogg, lies in the segregation of light and heavy feed stock for thermal and catalytic cracking, respectively. This operation is handled in a unique combination bubble tower which fractionates effluent from both the thermal cracker and the delayed coker as well as light cycle oil from the fluid "cat."

Light ends off the top of this tower go to the vapor recovery group which processes all refinery gaseous products. The overhead liquid product is a blend of coker and thermally cracked gasoline. A mixture of light cycle oil from the cat and light gas oil from the coker is withdrawn from the upper section for thermal cracker feed stock. Below this, heavy gas oil is taken off as cat cracker feed. The bottom product is tar.

Principal products, therefore, from the refinery are straight-run gasoline from the crude unit, a mixture of coker and thermally cracked gasoline from the combination tower, and catalytically cracked gasoline from the cat fractionator. These gasoline streams are separately stabilized and then blended in whatever proportions are indicated by the market. Seasonal vapor pressure requirements are fulfilled in the final step.

Main advantages of this type of combination processing, according to Kellogg, are found in the reduction in number of individual towers for fractionating the products from each unit process, and in savings in tankage for intermediate storage. Since the refinery is designed for continuous processing of the stream, intermediate product storage is minimized.

Of secondary importance, during the cold Canadian winters, is the fact that heating requirements are reduced to a minimum. Oil products lose only a negligible amount of heat during continuous processing. In instances where intermediate storage is needed at a refinery, process heat is lost through the necessity of cooling intermediates for storage.

First Platforming unit to be installed in Canada will be incorporated in the new $18,-million refinery of Canadian Oil Refineries Ltd., at Froomfield, Ont. The unit will have a capacity of 3,800 barrels daily. This will permit either the upgrading of octane quality of White Rose gasoline or the production of certain chemicals if that seems more expedient.

The Platforming process yields chemicals essential in producing high-octane aviation gasoline and this is important in defense plans. Other derivatives it makes available are needed in making synthetic rubber and will be supplied to the Polymer Corporation plant at Sarnia. Nylon, plastics and other products of both military and civilian importance use ingredients which the process produces.

Design and engineering work on the unit will be done by Universal Oil Products Co while actual construction will be handled by Procon, Inc.

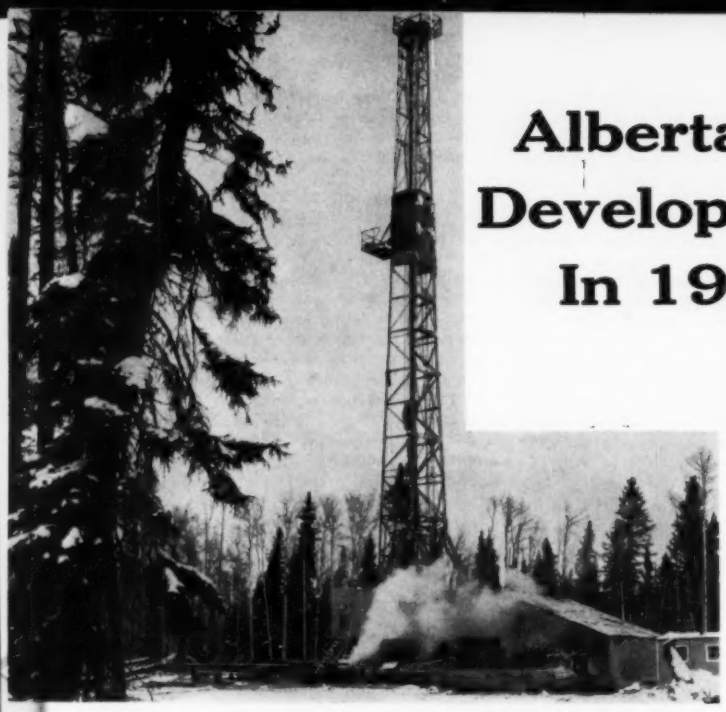
Petrochemical developments also are in the offing. British-American is working out a deal with Shawinigan Chemicals Ltd., for a joint operation. A plant is to be built as an adjunct to the B-A refinery at Montreal which will employ a newly developed process.

Although Canada is rapidly building a well-rounded refining industry it cannot be said that the job will be complete in 1952. By next year more capacity will be needed to keep ahead of the demand created by Canada's expanding economy.

Part of Imperial Oil Company's Sarnia refinery which will be the scene of a major construction program.

Alberta Oil Development In 1950

By Floyd K. Beach*



Initial drilling in the Salt Creek Area. H. Pollard photo.

THOSE who are active in oil development in the United States and who are not particularly acquainted with Canadian matters may fail to understand some of the pressures that are behind the methods and sequence of Canadian oil and gas operations and a brief review of some of these underlying principles is in order for an audience which is not entirely Canadian.

Some 50 or 60 years ago the Dominion of Canada owned almost the entire prairie land, which was largely unoccupied by settlers. The land was surveyed in a checkerboard pattern by the government and then opened for homestead. Any settler who wished might file on a quarter section and, by performing residence for a period of three years, or portions of three years, and breaking a certain amount of land, could acquire title, the total outlay being $10 plus his improvements. The Dominion government then decided that only the surface would be granted to the homesteader and any mines and minerals beneath the surface would remain the property of the government, or the "Crown" as the Canadian term goes. In 1930 what remained of the natural resources was handed over to the various western provinces. At that time there were some subsisting leases for the production of petroleum and natural gas and the provinces severally became responsible for honoring the existing leases and then had a free hand to deal with any remaining oil rights.

In Alberta a very farsighted policy has been inaugurated by Hon. N. E. Tanner, Minister of Mines and Minerals. Under this policy a person may take a reservation up to around 100,000 acres, for the purpose of geophysical or other forms of exploration and by assignment a company may acquire a number of reservations. By having a fairly large block of land to investigate, the company can afford to make a thorough geophysical examination, and many companies do make seismic surveys or gravity meter or magnetometer surveys, or a combination of several of these. Others examine their reservation by actually making a drill test.

After a period of examination, the holder of the reservation can convert a portion of the reservation to lease and the present arrangement is that the lease may be an area three miles square, containing nine sections if all of them are owned by the province (or a lesser amount, if some of the area has been alienated) or the lease may, at the option of the operator, be an area two miles by four miles. If the reservation or reservations are large enough, more than one such lease may be taken up but not more than half of the reservation can be leased and there must be a strip of land left between any two leases.

It can thus be seen that the Crown becomes the owner of "Crown Reserves" which are set up in the remaining parts of reservations that have been converted to lease, and these Crown reserves become highly valuable if oil is discovered on the leases taken out. We have consequently seen a succession of sales by the Alberta government of lands in the Redwater field, and it is quite a common thing for a quarter section to command a bonus from an oil company of the order of a million dollars or more.

With the background of ability to acquire large areas for examination and with the further background that two major fields have been discovered in the past four years; Leduc with its production centered over the most of one township and large portions of at least three surrounding townships, and Redwater with an axis nearly 18 miles long by three miles wide in places, and with probably a billion barrels of reserves in the two fields; great interest has been taken in exploration and reservations have been taken up over an area which would be an empire in some parts of the world. Some of them have gone to parts of the country which are entirely unsettled owing to climatic conditions; where the growing season is limited to a very short part of the year and where lack of surface drainage has brought about muskegs which are impassable by vehicles, or even by persons on foot, unless the ground is frozen.

As of January, Alberta had 97 seismograph parties, seven gravity meter and one magnetometer party working, a total of 105. Saskatchewan had another ten parties, of which nine were seismograph; and Manitoba had two seismograph parties working. Considering that a seismograph party may cost up to $20,000 a month in summertime or $25,000 a month in winter, this implies a sizable expenditure for studies of subsurface structure. It has meant the establishment in Alberta of three supply houses for geophysical equipment. It has meant large establishment of planes and helicopters and services for aerial survey as well as the servicing of isolated geophysical parties.

During 1950, 1,031 wells were completed. A few of these did not finish testing and have been included in these statistics because of the fact that rigs had been moved off and the wells would be lost track of if not included. These 1,031 wells involved 4,102,503 feet of hole drilled, for an average depth of 3,979 feet. This compares with only 784 wells drilled in 1949 for a total of 3,200,540 feet, or an average depth of 4,082 feet. Of the 1,031 wells drilled in 1950, 238 are classed as exploratory, of which 190 were new field wildcats, using the AAPG classification set up by Dr. F. H. Lahee; that is, about 23 percent of the holes drilled were exploratory. This was in the face of a great urge to drill development wells following the purchase of highly expensive Crown reserves. In Redwater alone 448 oil wells were drilled plus six dry holes and in Leduc there were 159 oil wells and 17 dry holes.

It is too early to assess the reserves of oil that were discovered during 1950, but the discovery rate was satisfactorily high, for the records show 20 oil discoveries, 17 gas and one condensate for a total of 38 discoveries out of 190 new field wildcats; and 24 oil extensions, and one gas extension out of 48 outposts, new pool wildcats and deeper pool tests.

This is not to say that there are 20 new oil fields for it has been necessary to class as new field wildcats several wells which finally may prove to be within the same field. However, this is a highly satisfactory rate of discovery.

New field discoveries are as follows:

Camrose: Discovered by Socony-Vacuum Exploration Company.

Acheson: Discovery wells by Imperial Oil Ltd. California Standard and Central Leduc.

Leduc: Long extensions in Leduc field at Ellerslie and Kavanagh to the east and Mic Max to the southwest, Pacific British Dominion and Terra to the east of the Woodbend sector. Of these, Terra found oil in the Viking sand. the Ellerslie and Pacific

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British Dominion wells found oil in the Blairmore sands and the other two wells were Nisku (D2) discoveries.

Whitelaw: In the northwestern section of the settled part of Alberta, Shell and British American discovered oil in Permo-Pennsylvanian beds, opening a new geological province for oil in Alberta.

Barons: Some 90 miles southeast of Calgary, oil was discovered in the Bow Island sand, and near Drumheller, 65 miles northeast of Calgary, oil was discovered in a Blairmore sand.

Big Valley: A few miles to the south of the Stettler field, discovered in 1949, Canadian Gulf found oil in two zones (both Nisku and Leduc formations) and Piccadilly Interleduc Laguerre found oil in a Blairmore sand to the northwest of the main field.

In the southern part of the province, discoveries were chalked up in two wells separated by several miles near Spring Coulee. Northwest of Edmonton, a discovery was made near Barrhead in Rundle limestone. Two interesting discoveries in the Viking sand were made during the year, one near Lisburn, some 50 miles west and a little north of Edmonton, and the other near Bulwark, about 115 miles southeast of Edmonton.

Gas discoveries were made in the Brandi field near Athabaska, at Jarvie, Spedden in the Campbell oil field, at Cardiff, Waybrook, and to the northeast of the Stettler field, all of these being in a radius of 100 miles from Edmonton; near Brooks, near Cessford with three discoveries at some distance apart, and near Sibbald, Youngstown, Drumheller and Baxter Lake, all on the plains to the east and northeast of Calgary.

Alberta has seen some ups and downs in the marketing situation. The discovery of oil in Turner Valley, back in 1936, loosed a supply which was greater than the local market could immediately absorb and operators were, for a time, worried about where they could dispose of their production but much of this was taken care of by shipments to Saskatchewan and Manitoba and after a few years the local supply was barely equal to the demand in the province of Alberta alone.

With the discovery of Leduc in 1947, it became evident that the supply of oil would be greater than could be absorbed immediately in Alberta and plans were laid for a pipe line which would go as far as Regina and would thus supply the greater bulk of the prairie market. Actually, a factory was built in eastern Canada to turn out 16-inch pipe and manufacture had already started when the discovery of Redwater called for a review of plans. It now became evident that Alberta oil could be marketed in Ontario. After a survey of conditions, it was decided to pipe oil to a Great Lakes terminal at Superior, Wis., and move it by tanker during the navigation season to Sarnia and other Ontario ports. The facilities established for this purpose are described elsewhere in this issue.

The rate at which this demand has increased since the end of World War II, both for the prairies and for all of Canada is surprising, and if we were to give a per capita consumption by years, this would also show an increase, although, owing to lack of census information, that could only be approximated.

In the face of this increased demand for petroleum products Canada could scarcely have become self supporting in view of the tremendous distances that have to be covered in moving oil and it is fully expected that the Atlantic and Pacific coasts will continue to receive imported oil for some time and that imports will continue to refineries at Montreal, which supply Quebec and eastern Ontario.

Several years ago, when the pipe line to the head of the lakes was planned, the writer made the comment that from the standpoint of the security of the continent in the event of war, he would have been happier had the line been planned to go to Chicago. Perhaps eventually that may develop but it is not in the immediate foreseeable future. At all events, Alberta oil producers are happy that they will be able to command the market in Ontario. Some discussions and studies have been made towards looking into the possibility of a pipe line to the Pacific coast but there is no immediate prospect of such a line being built.

At the present time a large proportion of the population of Alberta is supplied with natural gas. A pipe line was laid in 1912 from Bow Island to Calgary, about 170 miles, and branch lines went to the city of Lethbridge and to towns between Lethbridge and Calgary. When Bow Island field became exhausted, there was some difficulty in supplying Calgary but eventually gas from Turner Valley was piped in and has supplied that system. In the fall of 1950, another pipe line was laid from the Jumping Pound field to Calgary and a processing plant is under construction by Shell Oil Company in the Jumping Pound field. When completed this will take care of the needs of the Calgary-Lethbridge system for some years. In the north, a pipe line from the large Viking field was laid to Edmonton in 1923 and subsequent extensions now supply Vegreville, to the north of the main pipe line, and Camrose, Wetaskiwin, Ponoka, Lacombe and Red Deer, to the south. The original Viking field has now been extended by exploration and development drilling to include a very large area and that system appears to be in good supply for a period of years. In addition to these two large systems, the city of Medicine Hat is supplied by gas developed from wells owned by the city and distributed by the city and there are distribution systems in a number of towns from local supplies.

Additional supplies have been discovered which are not tributary to any of the lines mentioned, including a very large reservoir, at Pincher Creek which was discovered by Gulf, and a smaller reservoir in the Pakowki Lake area to the southeast of Foremost, discovered and developed by McColl-Frontenac and Union Oil. There are scattered discoveries covering a very large part of the province which have not yet been fully outlined as to their reserves, nor could many of these discoveries afford to be developed to a point where an accurate estimate of reserves is possible until markets are in sight.

Tubular goods have been difficult to obtain for some time, as well as the better class of steel products such as alloys and engines, pump lines and similar manufactured goods. So far, Canadian operators have probably had a share in steel goods about on a par with United States consumers. What effect the impending controls will have is a matter for conjecture. General shortage of tubular goods has brought about higher costs, not alone in higher prices for goods purchased, but also in delays during drilling, and such delays are always expensive.

Cement is manufactured at Exshaw, some 60 miles west of Calgary. That plant has been increased in capacity and further increases are contemplated. The oil industry has had a priority in cement supply and has been able to obtain its requirements.

Some 145 drilling rigs were reported in Western Canada late in 1950, but the problem of engaging a contractor is no small affair. Most of the rigs become tied up with companies who let contracts for new wells as fast as wells are completed. In August a rail strike tied up Canada for ten days and at that time a number of rigs were released, but immediately after the strike ended all rigs were again working in a short time. New ventures have sometimes had to wait for several months to get a contractor.

Up to the discovery of Leduc in early 1947, prairie refining capacity was geared to prairie supplies, to which some crude imports were added. Shortly after the discovery of Leduc, Imperial Oil Ltd. purchased a refinery that had been set up at Whitehorse, Alaska, during World War II and moved it down the Alaska highway to Edmonton. It was then able to look after markets in northern Alberta.

Imperial and British American refineries at Calgary and Gas and Oil Refineries at Hartell (south Turner Valley) have somewhat increased their capacity. Imperial and Saskatchewan Federated Cooperatives at Regina, Saskatchewan, and British American at Moose Jaw, Saskatchewan, have increased their capacity, and Imperial is building a large refinery at Winnipeg, Manitoba. Anglo Canadian refinery at Brandon was built to afford an outlet for Turner Valley oil during flush production from that field, and it now uses some oil from Interprovincial Pipe Line.

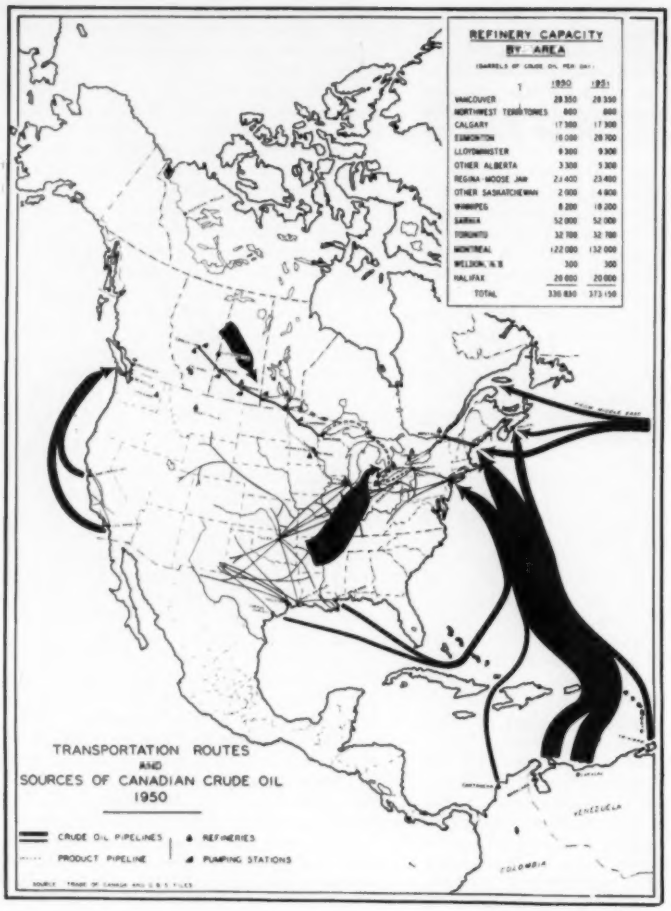
Both British American and McColl Frontenac (Canadian partner of Texaco) are building refineries at Edmonton, and Imperial is adding catalytic cracking to its Edmonton refinery.

Octane number of gasoline sold in Alberta has for some years been below the average for the continent, but Alberta's high altitude makes up for that deficiency. However, with competitors planning for better octane number to be obtained from catalytic cracking, Imperial is meeting the competitive situation both at Edmonton and Winnipeg.

An alkylate unit at Calgary uses isobutane from Turner Valley natural gasoline plants and butylene from cracking plants. There appears to be a surplus of normal butane, but no isomer plant has been put in owing to limited supplies of butylene.

1950 saw a gas processing plant erected at Devon in the Leduc field. It turns out natural gasoline for blending purposes, and also propane and butane. LPG in our northern climate must be mostly propane, for butane would not evaporate from outdoor containers in winter.

The Dominion government recently appointed Dr. O. B. Hopkins as petroleum coordinator. With an armament program under way, it is almost certain that increased difficulties in supply of critical materials will develop and it is expected that Dr. Hopkins will be able to coordinate requirements of the industry.



Strategic Importance Of Canadian Oil

By Kenneth R. Wilson

IN comparison with the world's great oil producers Canada hasn't found much oil—yet. And the oil that has been found is mostly 2,000 miles from the major Canadian markets. But, strategically, the Alberta discoveries, gradually mushrooming from the original Leduc strike of 1947, are rated very high in importance to North America.

Presently proven reserves in the Alberta field now constitute the fifth or sixth most important oil source in North America. These reserves are now rated at 1¼ billion barrels, about the same as Mexico. Four areas in the United States have greater proven supplies —Texas, California, Louisiana and Oklahoma.

The Alberta field is the only important domestic crude production area in Canada. Last year it produced about 20 percent of Canadian requirements. This year that proportion will rise closer to one-third. This will put the three Canadian prairie provinces on a self-sufficiency basis. And Alberta oil will move into central Canada for the first time in history.

This Canadian oil has been slow in getting to market. That's because 60 percent of the nation's petroleum requirements, refinery capacity and population are in the central provinces of Ontario and Quebec. These big markets are 2,000 miles away from Edmonton, the center of the oil boom. The city of Montreal (2,153 miles from Edmonton) has 40 percent of Canada's refinery capacity; is presently fed by tanker, or by pipeline from Portland, Maine.

To tap part of this central Canada market, a new 1,200-mile pipeline is now in operation. Its outlet is at Superior, Wisconsin, at the head of the Great Lakes. Since crude can be moved on the Great Lakes for only seven months of the year, this requires storage to receive winter pipeline movements. It also requires additional storage and refinery capacity at the present important refinery center of Sarnia. It will be the spring of 1953 before this program can be completed.

Already, some $500 million has been spent since 1947 to discover, develop and market these new Alberta fields. Projected expenditure for exploration, development and refineries, in 1951 and 1952, will cost an estimated further $400 million. It is expected that the normal growth pattern of the present Canadian reserves will be of the order of 330,000,000 barrels annually. The field is headed for the most active year in its history.

The above program is exclusive of pipeline development. At least two important product lines linking Sarnia and Toronto, and Montreal-Toronto, respectively, have top priority for 1951. But Canada is far from self-sufficient in plate or pipe capacity; will have to lean heavily on United States allocations to carry out these two programs.

Also under active consideration are projected crude pipelines from Alberta westward to British Columbia. One of these is an "all-Canadian" route from Edmonton through the Yellowhead Pass to Vancouver. The other is from Pincher Creek, south through the United States and up into Canada at the coast.

The proposal for a new west coast pipeline gets right at the heart of the strategy and economics of Canadian oil.

It is clear that if a third world war were to break out, a crude line from Alberta to the West Coast would rate very high priority. The main reason is that it would give the vitally important Pacific Northwest its only direct access to crude that would be free from the hazards of ocean shipping.

Until oil was discovered in substantial quantity in Alberta, the nearest supply source for west coast operations was California. That's why the United States spent $134 million on the notorious Canol project in World War II. This was a plan to bring crude from Fort Norman (100 miles south of the Arctic Circle on the MacKenzie River) to Whitehorse and Skagway, a distance of more than 400 miles.

Discovery of oil 300 miles north of the Canada-United States boundary is therefore

a tremendous relief to the military planners. They need no longer worry so much about California's increasing "deficit" position or the vulnerability of the Pacific northwest states; nor servicing defense operations in Alaska. (In Canada itself, the Royal Canadian Air Force is pushing ahead with great rapidity, a plan to again turn parts of the Canadian prairie provinces into a vast air training establishment for Canadian and NATO countries. Requirements for this project alone, call for consumption of aviation gasoline at several times the projected annual rate for all-Canada, prior to Korea.)

In view of these considerations why should there be any hesitation about a west coast pipeline? Why hasn't Canadian oil moved to the coast before this?

In the first place, the cost of moving crude from Alberta to the west coast by rail is prohibitive. But the outlook for a pipeline has also been discouraging.

There is 800 to 1,000 miles of difficult and expensive terrain through the Rocky Mountains. Present estimated cost for either of the presently suggested routes, is $75 to $80 million. And at the end of the line is a British Columbia market for only 30,000 barrels per day of light crude, with refining capacity for two-thirds of this.

Normal supply for this area is presently California crude which is laid down in British Columbia at about $3.06 a barrel. Thus, on the basis of a line to supply British Columbia alone, transportation costs are too high. What is required is some additional market in the United States, sufficient to bring throughput up to 70,000 or 100,000 barrels daily.

But there is presently insufficient refining capacity in Washington and Oregon. And who is going to build a west coast line to handle Canadian crude, without assurance that the United States tariff structure won't be changed so as to make the whole operation uneconomic?

As is well known, the United States tariff on Canadian or other imported crude was 10½ cents until the Mexican treaty was abrogated last year. Now, only a percentage of crude gets into the United States at the lower rate. Most of it pays 21 cents. Furthermore, there were demands in Congress only last year, to boost the tariff to $1.05 a barrel.

That's why, when the first big decision to market Alberta crude was made, it was to build a pipeline eastward, to service (1) the Canadian prairie provinces, and (2) the western part of the central provinces of Ontario and Quebec. Through 1950, there hadn't been sufficient additional reserves uncovered in Alberta to make the search for new additional markets very pressing.

Early in 1950, however, as defense and rearmament problems sharpened, the Canadian government named Dr. O. B. Hopkins, vice-president of Imperial Oil, Limited, as director of a Petroleum Division in the newly-created federal Department of Defense Production. Dr. Hopkins is one of the leading authorities in the Canadian industry. He has a long and intimate association in the production of crude oil in Western Canada. His new division is primarily concerned with the development of the Canadian industry and the correlation of plans for increasing crude oil production, refining and transportation facilities. Close liaison has been established with the Petroleum Administration for Defense in Washington on problems of common interest.

The immediate concern of the new administration is to expedite and encourage more development and oil production in western Canada. This program alone calls for estimated expenditure in 1951 and 1952 of between $200 and $250 million.

Of equally high priority is a program to expedite procurement of tankers, pumping equipment, storage and refining capacity, now required to make the greatest possible use of existing Alberta production. Between $175 and $200 million will likely be spent on this phase of Canadian expansion in the next two years.

With distribution and marketing bottlenecks removed, the Canadian position would be about in balance by early 1953. That is: the entire production of new crude from Alberta would be absorbed in meeting the needs of the three western provinces (Alberta, Saskatchewan and Manitoba) plus southern and central Ontario. This would mean that Canada gained oil self-sufficiency up to about one-third of her oil needs.

But what happens, if, as, and when Canada's crude reserves continue to mount at rates comparable to the growth in 1947-50? Where will the next market be found?

The first imponderable in answering these questions, centers round the issue of peace or war.

As already indicated, the outbreak of war would almost certainly make a pipeline to the west coast, a top priority job. This would give North America and the NATO partnership a ready and protected domestic oil supply at a highly strategic point. If oil were needed in that area beyond the then proven reserve capacity, it would facilitate conversion of the famed Alberta tar sands. These sands contain a minimum proven reserve of at least a billion barrels. And recent developments appear to bring close their economic exploitation, once the heavy cost of necessary capital equipment is met.

But barring all-out war, or a much stronger over-riding directive by defense authorities in Washington, the hard facts of economics remain.

Until there is a firmer realization in Congress that the United States has become a net importer of oil, or until some way can be found to ensure long term tariff reciprocity across the Canada-U. S. border, the flow of Canadian crude into the U.S.A. will remain a hazardous undertaking.

That is not to say that the problem won't be solved and that the pipeline won't be built. Already, as has been indicated, there are at least two very definite proposals under consideration to build such a line.

And on the favorable side of the west coast pipeline ledger there is a potential overall market in the Pacific northwest of close to 350,000 barrels daily. Present indications suggest that California reserves are getting increasingly inadequate for her own needs, let alone the supply of a rapidly expanding market in the northwest. The Canadian supply would be within 800 miles of this market, against 2,000 miles if it were to be supplied from Texas, via California.

But unless war intervenes, it can't be assumed that Alberta oil will move to the Pacific and into the northwest states without some pretty hot competitive jockeying. Permission was sought last year for a transmission line from West Texas to California which would permit Texas crude to move up the coast to the Pacific northwest. Very soon afterwards, this was followed by the initial application for a line to tap the Canadian field via a line running from southern Alberta through the northern United States and thence to Vancouver.

Now that steel has become a critical item, these and other schemes are presently in the priority hopper at Washington and Ottawa. Just what will emerge is presently anyone's guess. But the high strategic importance of the Canadian field, plus the obvious continental economics of using Canadian oil in the northwest, and United States oil in the east, make it appear that there may be some speed-up in Canadian development in the next few years, beyond what might have happened under more normal competitive conditions.

What about other possible outlets for Alberta crude?

There are two other possibilities: (1) Enlargement and extension of the present Edmonton Superior pipeline to serve the midwest Minneapolis field. (2) Extension of present connections eastward to Montreal, where 40 percent of Canada's refining capacity is located.

A careful study of the merits of these potential markets as compared with the west coast proposal, shows no very sharp variation in the netback to Alberta producers.

The midwest Minneapolis area appears to be a natural outlet for Alberta oil. It would be, if there were no international border.

This area has a 1955 potential of 200,000 barrels daily. But it has almost no refining capacity. Thus to tie this area to the Alberta field, would require a heavy investment whose profitability might depend largely if not entirely on whether quotas or other curbs may in future be placed against cross-border oil transfers.

Here again, the present economics of the oil business does not suggest an early movement of this sort, despite the fact that strategically, there are strong arguments for diverting United States crude to other parts of the continent and saving transportation costs by piping Canadian crude into the Minneapolis sector.

Superficially, it would also appear that movement of Alberta crude to United States refining centers along the Great Lakes, might appear to provide another potential outlet. But any movement of this kind would involve large investments in storage to provide for year-round operation. And since these refinery centers are already supplied by direct pipeline from United States fields, it would seem unlikely that they would be very interested, under today's conditions, in making the necessary investment to use Canadian crude.

The final possible outlet for Canadian crude is the Canadian refining center of Montreal where 40 percent of Canada's refining capacity, about 130,000 barrels a day on a 1955 basis, is located. The balancing factor in this market is the price of sea borne crude at Montreal, and the present large pipeline investment between that city and Portland, Maine, on the Atlantic seaboard. This pipe-

(Continued on page 106)

A Hiller 360 of the Kenting Fleet about to pick up two ground surveyors.

Airborne Aids To Oil Development In Canada

By J. H. Cornell*

AIRCRAFT and instruments which may be carried in aircraft are proving to be among the most useful tools available to those engaged in the exploration and development of Canada's rapidly expanding oil fields.

Both the conventional airplane and the helicopter are playing important roles in the big boom, principally because of the nature of the country, the vast distances involved and the difficulties of normal transportation over rugged mountains, spreading prairies, and trackless muskeg.

Some few oil companies carry out air operations for themselves, using their own aircraft and equipment, but most of the airborne work to date has been done by independent contractors who specialize in air surveys of various types.

One of the most important aerial survey projects in Canada having a direct relationship to the oil industry is the current assignment being carried out for the government of Alberta by The Photographic Survey Corp. Ltd. and affiliated companies.

Begun in 1949 and scheduled for completion next year, this gigantic survey involves the photography and mapping of 185,000 square miles of territory, which will complete the coverage of the entire province. The photographs and maps obtained will be invaluable in planning the development of all Alberta's natural resources, but they are most urgently needed by the oil industry.

Some completed map sheets, accurately compiled at a scale of 1" to the mile by photogrammetric methods already have been delivered to the Alberta government and are available to oil exploration companies and operators.

The flying operations on this project are being carried out for the most part with Lockheed aircraft. Airborne camera crews are in the field from late spring to autumn, and the work of translating the aerial photos into maps goes on the year 'round in PSC's Toronto laboratories. Among the areas already mapped are Whitecourt, Athabasca and Grande Prairie in Central Alberta.

One important aspect of the Alberta survey, not directly related to the oil industry but of great potential importance to the province's economy, is a timber inventory of some 95,000 square miles of forested lands. Special large-scale photographic coverage of these areas is being obtained, from which accurate data are being compiled on the amount, quality and species of timber making up the province's forest resources.

The government of Alberta is investing in the neighborhood of a million dollars in the complete 185,000 square miles aerial photographic survey, with every expectation that it will pay rich dividends in speeding the development of oil and other natural resources.

The aerial camera proved of great value as a time and money saver in planning the location of the Interprovincial Pipe Line from Edmonton to Superior, Wis.

To assist the engineers in their preliminary reconnaissance survey, a strip of territory three miles wide along the entire route was photographed at a scale of 3" to the mile. The aerial photos were assembled into a mosaic which clearly indicated to the planners all the major features of the terrain and saved a great deal of survey work on the ground.

A new survey tool which holds great promise as an aid to pipe line location is the Airborne Profile Recorder, an electronic device developed in the laboratories of PSC Applied Research Ltd., a subsidiary of The Photographic Survey Corporation, Ltd.

This new instrument is a refinement of the radar altimeter, on which preliminary research and experimentation were carried out by the National Research Council of Canada and the Dominion Department of Mines and Resources in 1946.

The APR can produce an elevation profile record accurate to plus or minus 10 feet along a selected line over any terrain. To do this, it uses a radar beam projected downward from an aircraft to measure the actual clearance between the aircraft and the ground. The elevation profile of the ground is produced in the form of a continuous record of these measurements, taken in continuous sequence as the aircraft flies along the line to be surveyed.

Since the aircraft's height above sea level, measured by a pressure-sensitive altimeter, is the reference datum for the ground clearance readings, and since it is impossible to keep this height exactly constant in flight, a method of stabilizing the reference datum is necessary. An electronic unit for this purpose has been built into the APR capable of compensating for air bumps and other deviations from "constant" height.

This new surveying tool has many time and money saving applications, particularly in preliminary reconnaissance for the selection of

* The Photographic Survey Corporation, Ltd., Calgary.

locations for communication systems and pipe lines.

One survey of this type, recently completed successfully, involved the location of a line of communication over very rugged territory, where ground surveying would have been slow, difficult and costly. A tentative line had been selected for the installation by the contractors, using the best available maps, when Photographic Survey Corporation was called in and asked to check the selected route with the Airborne Profile Recorder.

The result was that several sites and one complete leg of the communication network were re-located because of topography not indicated on the available maps. In one place, a hill 500 feet high was revealed in the middle of what had been thought to be a level plain.

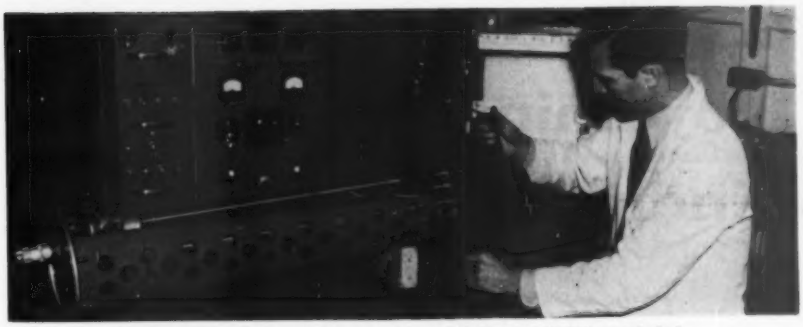
After the APR had been used to determine the unsuitability of the previously selected route, it was further used to select a suitable location line. A strip map of the approved route, showing ground contours, was prepared with the APR data providing control for the mapping, which was done with a Wild A5 Autograph machine.

During the past few years, the helicopter has been developed and improved to the point where it is now a very useful tool for air surveying generally and oil exploration particularly. Especially good use is being made of it in Canada, where a series of test operations under difficult conditions have revealed the rotary-winged craft as a practical aid to photogrammetric mapping and also as a very satisfactory means of transporting seismic crews and other exploration personnel.

Using three Hiller 360 helicopters, two survey expeditions working in Canada's Yukon territory last summer set up air-lifts for observation parties. Results indicate that while the helicopter's operating limitations still place some restrictions on its efficiency, nevertheless its employment in rugged country enables one observing party to do approximately the work of four parties using ground transportation to establish ground control for photogrammetric mapping.

Two helicopters were used by the Topographical Survey branch of the Department of Mines and Technical Surveys, working in an area 100 miles north and east of Mayo. Some 24,000 square miles were covered.

This party was headed by A. C. Tuttle, acting under the direction of P. E. Palmer, chief topographical engineer. Seven thousand square miles of territory adjacent to the Alaska Highway, west of Whitehorse were covered by an army group using one helicopter and headed by Capt. W. A. Johnstone, under the supervision of Lieut.-Col. C. H. Smith, deputy director of Military Survey for the Canadian Army Survey Establishment.



Airborne magnetometer developed in Canada by PSC Applied Research, Ltd.

The purpose of both operations was to put in a network of control stations for mapping from photographs taken by the RCAF, a task rendered more urgent by the strategic importance of this area. The helicopters, used in conjunction with conventional supply aircraft which can land on suitably located lakes, increased the working capacity of the groups. The job of the helicopters was to transport the climbing parties of two men each, with their equipment, from base camps to observation stations.

The Mayo expedition, between June 15, when the first helicopter arrived on location, and September 10, when ice formation on the lakes began to hamper the operation of the conventional supply plane, climbed 126 hills, 108 of them being successfully observed at the first attempt. During the complete period of 88 days, 45 days were completely washed out due to unsatisfactory weather and observing conditions. The two helicopters flew 425 hours, 390 on actual survey operations.

The value of the helicopter in seismic exploration has already been proved by experience in swamp areas in the United States. It is likely to be further demonstrated by operations in Alberta.

Northern Alberta, the area lying north and east of the Peace River district, presents exploration problems of a type seldom encountered before. It is largely covered by forest and muskeg; there are no roads and the number of lakes upon which an aircraft on pontoons can land is very limited.

In much of the muskeg and semi-muskeg country, the winter season is being relied upon as the time to accomplish most seismic work. At this time the ground is solid and truck-mounted field equipment can move, though with difficulty. Also at this season timber becomes quite brittle, and obstructions can consequently be cleared rather easily with a heavy bulldozer. The going is rough at best, however, and transportation maintenance costs run high. The best that can be expected for this period is four months with severe cold, drifting snow, high winds and unseasonal thaws to hamper operations.

As an alternative, the efficient use of helicopters in such areas would make possible seismic operations during at least six of the remaining eight months. Helicopters might also be used to accelerate the winter work. With proper planning, helicopter-borne seismic crews could be put on a competitive basis with any other method in terms of cost per continuous line mile or per profile. The value of being able to move men back and forth from the base camp to the field in terms of time, wear-and-tear on men and equipment, and morale, is obvious. They can be on the job in a matter of minutes.

The major problem involved in the use of helicopters for seismic work at the moment is the load factor. Apart from hand augers, which may be used only in cases of very thin weathering in a few rather isolated spots, drill equipment is too heavy for helicopter transportation, generally speaking. However, helicopter performance and load-carrying ability are being constantly improved, and the load factor should soon cease to be a serious obstacle.

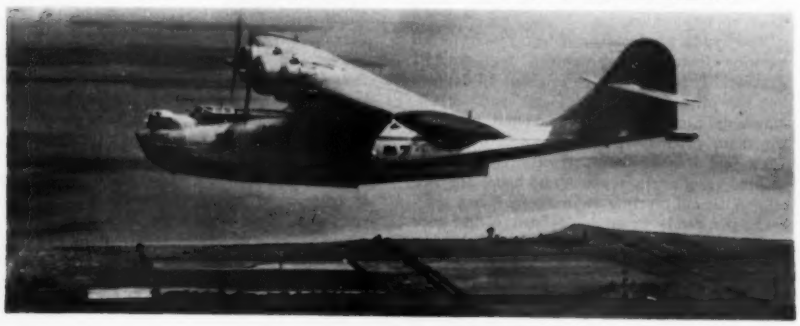
The airborne magnetometer, of course, is well known and widely recognized as an invaluable tool of oil exploration.

It is being used effectively in many parts of Canada by several companies who offer geophysical exploration service.

The instrument operated by Aeromagnetic Surveys Ltd., an affiliate of The Photographic Survey Corporation was developed by PSC Applied Research Ltd. and is carried in either a Canso or a Lockheed aircraft. Among the oil operators who have used it for Western Canada surveys in Alberta and Saskatchewan are Tidewater Associated Oil Co., Superior Oils Ltd., International Petroleums Ltd., Time Oils Ltd., Barnsdall Oil Co., and others.

These then, are some of the airborne aids to oil development in Canada. Others exist and more will be developed as time goes on. Many oil men believe that Canada's potential is only vaguely realized as yet, and there seems little doubt that airborne exploration tools will play an important role in bringing to light new reserves in widely scattered parts of the Dominion.

Canso amphibian used for magnetometer work in Canada. Note the "bird" tail assembly.



Lloydminster's Black Oil Finding New Markets

By H. D. Watson*

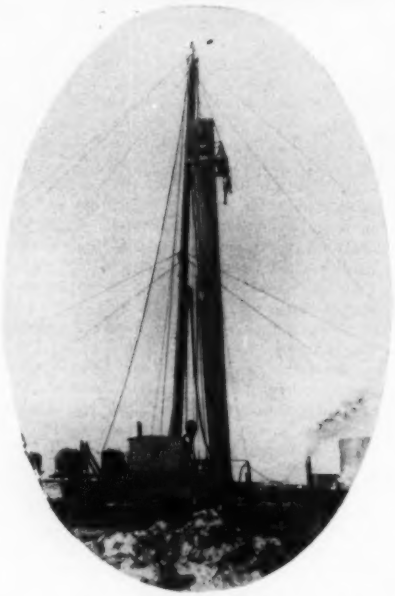
LLOYDMINSTER Oil Fields, overshadowed for a time by the more spectacular light oil fields of the Edmonton area, is now regaining recognition as an important Dominion oil development. Known as Canada's largest black oil field and recognized as a producer of superior asphalts and industrial fuel oils, it was the only bright mark on an otherwise unimpressive oil horizon up to the time of the Leduc discovery. At present it rates fourth in importance following the Redwater, Leduc and Turner Valley fields. With greater demand arising for the products of black oil further advancement in development of this area is anticipated.

The Lloydminster field is located 160 miles east of Edmonton on the Alberta-Saskatchewan interprovincial border with production fairly evenly divided. Commercial production is obtained within an area extending eight miles north of the town of Lloydminster, 36 miles south, 12 miles west and 30 miles east. There are three main producing pools within this extensive area: the Lloydminster pool on the border, the Blackfoot pool, to the west in Alberta, and the Lone Rock pool, sixteen miles to the south of Lloydminster in Saskatchewan. In addition there are numerous minor pools, most of them discovered within the past two years, some of which give promise of developing into important producing areas.

Within the above area 631 wells had been drilled up to December 31, 1950 of which 290 were producing, 66 were suspended and 35 were awaiting test. Of the remainder 24 were gas wells, 158 had been abandoned and the others were standing.

Cumulative production total to the end of 1950 was 6,071,537 barrels. Practically all of this has been produced since 1947, a remarkable feat for wells which do not average over 30 barrels of oil per day. Production the past year reached a new high with 1,896,180 barrels recovered. The proven reserves of the field have been estimated at over 75,000,000 barrels with probable reserves placed by various authorities at over 300,000,000 barrels.

Lloydminster crude is obtained at depths averaging about 1,850 feet from beds of Lower Cretaceous age. The oil in some instances flows to the surface but all wells are placed on pump. The general practice in the early wells was to set production casing in the top of the production zone and complete the well in open hole but now the more general practice is one of setting the pipe through the oil zone and gaining production by means of gun perforation. Ten acre spacing is allowed but a twenty acre pattern is gaining favor among the operators. Cost of drilling and completing a well on production with all equipment runs at about $25,000. The time required to drill and case a well runs from four to six days. Drilling difficulties are few but production problems have been numerous in the past. Shutting in of wells for any reason sometimes results in sandling up, requiring servicing operations to place them back on production.



Winter on location of Abercam Oil Corp. in Lone Rock section of Lloydminster.

The crude produced is a heavy viscous oil ranging from ten to nineteen degrees API gravity. The field average is about 15 degrees but the oil from the Lone Rock pool is considerably higher. It is an asphalt base oil, the main products refined from it being asphalt and Bunker "C" fuel oil. By-products include gasoline, diesel fuel, and house furnace oil. With appropriate refining facilities however, the crude could be refined to produce larger quantities of gasoline and lubricating oils.

Exploration for oil and gas in the Lloydminster started over twenty-five years ago but the field is considered to have had its real beginning with the completion of the first commercial gas well, just north of the town, by the Lloydminster Gas Co. in 1934. It is interesting to note that the gas was obtained from a horizon which underlies the present producing oil and gas zones. Only oil shows were reported in this early well. Several gas wells were completed in the years following but attempts to produce oil commercially failed. In 1943 the Sparky No. 1 well, located four miles west, was completed as an oil producer and the producing sands were given the name Sparky. Drilling however was spasmodic and it was not until 1945 that there was any semblance of an oil field. In 1946 the producing area was doubled and the actual production exceeded the demand, stressing the need for additional refining facilities.

The year 1947 was the most active year to date; 179 wells were drilled, production increased fourfold to 3700 barrels per day, the Husky Refining Co. went into operation and the price of oil was raised ten cents per barrel late in the year. It then ranged $1.25 to $1.37 for a gravity range from 10 to 19.9 degrees.

It was during 1948 that the Leduc and Redwater discoveries began to affect the Lloydminster field. Production passed the 5000 barrel per day mark for the first time in July but by December had fallen back to 2600 barrels. The increased production of the light oil fields resulted in a flooding of the western markets with Bunker "C" fuel oil and the Lloydminster producers were forced to resort to voluntary pro-rationing of the wells, through a board governed by the Lloydminster Petroleum Association.

Marketing difficulties continued through 1949 and in addition the producers suffered a price cut of twenty cents per barrel, resulting in a minimum of development work. During the year however, the Lloydminster Petroleum Association was able to get the eight percent sales tax on fuel oil removed and this assisted in broadening markets later.

The marketing situation improved considerably during the past year and pro-rationing was discontinued, but development did not meet the increasing demand. This was rectified by two price increases, one of 10 cents a barrel in July and one of 25 cents per barrel in October. The price now ranges from $1.40 to $1.52 for gravity range from 10 to 19.9 degrees. Current prices place marginal wells on a profitable basis and give the inducement for further developments.

The completion of the Interprovincial Pipe Line from Edmonton to Superior, plus the improved refinery facilities for light crudes, has resulted in a marked decrease in the amount of Bunker "C" which was flooding the Northwest prairie region, improving the Lloydminster position considerably.

Demand has been increased with the continued conversion by the railroads from coal to oil burning locomotives and by industrial and power plants equipping boilers to use Bunker "C" fuel oil. The oil is also being more widely used in the briquetting of western coals. Asphalt demands also are certain to increase. During 1950 only 550 miles of road were hard-surfaced in the provinces of Alberta, Saskatchewan and Manitoba but road improvement will expand with the growth of industry and population. In addition to provincial highways the Trans Canada Highway

*Secretary, Lloydminster Petroleum Association.

probably will be completed within the next few years.

During the coming year the report of the Royal Commission on Transportation will be presented to the Dominion government. Because of its geographic location Lloydminster oil has had to pay high freight rates to reach markets at any distance, thus limiting its marketing area. The case of the Lloydminster producers was presented to the Commission by the Lloydminster Petroleum Association during hearings held in June 1949, and was followed up by the Saskatchewan government at the Ottawa hearings held in November 1949. More favorable freight rates will do much to expand the market and may even make it possible to reach the Pacific Coast and compete for the large markets at that point.

Two refineries are located at Lloydminster. The Husky Oil and Refining Ltd. operate a refinery with a capacity of 7,500 barrels per day. Excelsior Refineries Ltd. handles 1,500 barrels daily and is in process of increasing this to 3,000 barrels. Franco Oils Ltd. operates a cleaning and desalting plant of 200-barrel capacity in the Lone Rock field. All three of these companies hold acreage in the area and are doing considerable development work.

A new asphalt plant is now under construction at Lloydminster for the Sidney Roofing and Paper Company Ltd. of Victoria. Initial expenditures will be one half million dollars. This company manufactures asphalt shingles, rolled roofing, asphalt siding and other asphalt products. The plant will start operation within the next few months.

Cumulative Production in Barrels

Year	Saskatchewan	Alberta	Total
1929-44	331	49,106	49,437
1945	16,508	28,321	44,829
1946	136,374	76,187	212,561
1947	540,117	308,394	848,511
1948	856,821	652,237	1,509,058
1949	784,639	725,812	1,510,451
1950	1,052,532	843,648	1,896,180
TOTAL	3,387,322	2,683,705	6,071,027

Canada Sets Record in Growth of Consumption

IN virtually every field of human endeavor Canada was booming in 1950. More than 200 new manufacturing plants began operations during the year. Previously established operations in fields, forests, mines and factories were expanded to meet growth in export sales, particularly sales to the United States. Gross National product rose to $17,000 million, an increase of 50 percent in the past five years. Foreign trade rose nine percent in 1950 to $6,300 million. Pulp for paper and metals for world rearmament each contributed more than $1,000 million to Dominion production.

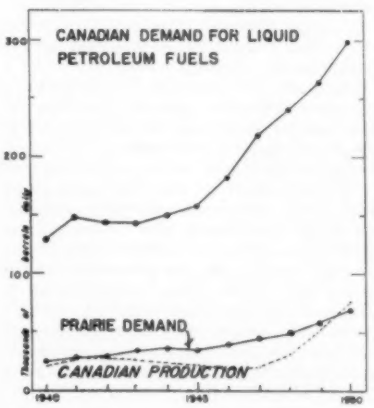
Stimulated by this general improvement in the national economy, consumption of petroleum products increased approximately 14 percent in 1950 to 357,400 barrels per day. This compares with an increase of 12 percent in the United States and 11 percent in the world demand for oil. Canadian demand has doubled in the past seven years.

A considerable part of the refinery construction begun in 1948 and 1949 was ready for operation during 1950. As a result crude runs to stills in Canadian refineries increased steadily throughout the year. Average increase in throughput was about 13.4 percent to 109 million barrels. The increase in throughput was 12.8 million barrels or about 35,000 barrels daily average.

The expansion in refinery activity centered in Quebec and Alberta. In Quebec and the Maritimes product production was 8 million barrels higher in 1950. In Alberta, Manitoba and Saskatchewan the increase was 5.4 million barrels. With the Prairies largely meeting their own needs for the first time, product of Ontario refineries was 1.4 million barrels below 1949. This situation will change materially in 1951 with the opening of navigation on the Great Lakes which will supply 70,000 barrels of Prairie crude per day to Ontario plants. Of course not all of the 70,000 barrels each day will be added to crude runs since a great deal of the oil will supplant crude previously imported from United States fields.

Increases in product of Canadian refineries in 1950 was not quite enough to keep pace with the sharp upturn in consumer demand. The same may be said of crude oil production which increased 20,800 barrels daily average in 1950 to 78,300 barrels. Refinery product and crude output increased at about the same rate. With the opening of the Interprovincial Pipe Line to full operation this month, an immediate increase of another 25,000 barrels in western crude production will be possible so that the deficit in national product will be minimized. It has been estimated that the recent western oil discoveries will save $140 in foreign exchange in 1951.

Motor vehicle registrations in Canada as indicated in the accompanying table have increased more than 50 percent since the close of World War II. The rate of increase in motor gasoline consumption during the past year has not been as great as that of aviation gasoline or of fuel oils. In 1950 indicated consumption of motor gasoline rose 11.2 percent to 49.6 million barrels. Aviation gasoline demand rose 28 percent to 1.7 million barrels and naphtha specialties 14 percent to 1.0 million barrels.



The astonishing demand increases were in the lighter fuel grades. No. 1 fuel oil consumption was 30 percent higher than in 1949, rising to 6.8 million barrels. Fuels Nos. 2 and 3 increased 48 percent in demand to 13.8 million barrels while heavy fuels Nos. 5 and 6 increase 14 percent to 26.97 barrels.

MOTOR VEHICLE REGISTRATIONS

	Cars	Trucks	Buses	Total Motor Vehicles
1935	989,744	172,775	1,848	1,164,367
1940	1,234,637	247,634	2,916	1,485,187
1945	1,160,058	314,327	5,282	1,479,667
1950	1,650,641	536,909	7,379	2,194,929

The following tabulation prepared by John F. Fairlie manager of the economics department of Imperial Oil Ltd. gives a thumbnail sketch of Canadian supply and demand in recent years:

CANADIAN SUPPLY AND DEMAND FOR OIL
(Thousands of barrels daily)

Demand	1940	1949	1950
Total Demand	156.5	315.1	358.5
Exports	1.3	1.6	1.1
Domestic Demand	155.2	313.5	357.4
Supply			
Crude Production	22.9	57.5	78.3
Additives (1)	4.6	6.6	5.0
Crude Imports	116.7	206.7	224.1
Product Imports	16.4	44.2	62.9
Total Supply	160.5	315.0	370.3
Inventories			
Stock Changes	+4.0	—0.1	+11.8

(1) Includes natural gasoline.

Oil Brings Prosperity to Alberta

By A. C. Ballantine*

THAT same cheerful confidence which the earliest settlers brought to the opening up of Alberta half a century ago and more is perpetuated today in the oil fields. The former came in search of lands on which to grow grain and raise the herds for which this Canadian province is still famous. Later the oil seekers came, empire builders in their way as the settlers were in theirs. But what most of the settlers took a generation to accomplish the oil men have done in a few years.

Today Alberta supplies 95 percent of all the oil produced in Canada and most of the exploration for new sources is being carried out in this province. Of 120 rigs drilling in Western Canada toward the end of last year 114 were operating in Alberta. Of 25,048,400 barrels produced in Western Canada in eleven months of the same year, 25,122,340 were produced in Alberta. Of 1,100 completions in Western Canada 90 percent were in Alberta. More than 800 of this number turned out to be producers, of which 89 percent were in Alberta.

Although the search for oil had been going on in this province sporadically for many years, the real history of Alberta oil may be said to commence with the Dingman discovery in 1914. It was a decade later when Royalite No. 4 was brought in with the production of wet gas from the limestone. In 1929 the Home well made a name for itself with a production of some 700 barrels daily and in 1936 Turner Valley Royalties brought the western flank of the structure into the spotlight. In 1942 the Valley's output reached its peak of 10 million barrels, after which a decline in production set in which soon became sufficiently disconcerting to stimulate the search for new sources.

This was rewarded in February, 1947, by discovery of the now famous Leduc field, and from this date the story of Alberta oil was no longer mildly interesting but sensational.

Alberta's early adventures in oil production were less than adequate to meet local needs; today the output is able to supply the prairie market. Now the Interprovincial pipe line is carrying thousands of barrels daily to Lakehead at Superior, Wis., and when navigation opens in the spring the accumulated stocks will start moving to Ontario refineries and thence into the markets of Eastern Canada.

It has been estimated that by that time the daily average output of the Alberta field will be about 120,000 barrels; indeed, the first week of the present year saw deliveries leap from 61,000 to 103,000 barrels daily. Even allowing that the heavier deliveries may tend slightly to depress wellhead prices, 120,000 barrels a day represents slightly over $100 million a year to the primary producers.

In 1946, before the Leduc, Redwater and other discoveries, the output including natural gasoline was 7,137,583 barrels valued at $14,348,069; that of all Canada was 7,729,193 barrels valued at $19,288,837. In 1949, the corresponding figures for Alberta were 20,246,466 barrels valued at $58,999,936. Estimated Alberta production for 1950 is about 28 million barrels having a gross value of about $84 millions.

Tank cars loading at Leduc railhead. Alberta Government photo.

This record production was achieved, moreover, in the face of stringent "allowables" made necessary by the disparity between possible production, refinery capacity and available transportation facilities. It was to overcome this that the 1,127-mile pipeline from Edmonton to Superior was undertaken and completed well ahead of the 150-day timetable.

Disregarding the relief afforded by the pipe line, since "before Leduc," as time is reckoned in the Alberta oil fields, Western Canada refinery capacity has risen from a few thousand to over 85,000 barrels daily. Of this capacity 40,680 barrels a day is located in Alberta, 37,600 in Saskatchewan and 7,100 in Manitoba. It must be noted, however, that not only is all of the Alberta capacity devoted to processing Alberta oil but so also is that of most of the refineries in Saskatchewan, a growing though not yet great oil producer, and in Manitoba which has yet to enter the producing column.

Naturally the effect of the oil fields on Alberta industry has been most noticeable in the business of refining, but the path of the driller has been well trodden also by strong forces of ancillaries including lease agents, consulting petroleum engineers, researchers, exploration contractors, equipment manufacturers and distributors, pipe line contractors, laboratories and various oilfield services, instrument dealers, dealers in seismic supplies and a variety of callings totally foreign to Alberta until recent days.

The effect on the employment market cannot be measured with complete accuracy, but it is estimated that not less than 10,000, about one in every hundred, from office boys to executives are employed in the oil industry either directly or indirectly. This number includes graduates from practically every Canadian university and also, during the season, large numbers of undergraduates earning some of their college expenses.

The effects reach far beyond the immediate confines of the industry. More grain has to be grown, more houses have to be built, more bread baked, more furniture sold, more household appliances of every kind. There are more pupils for more schools. There are also a few inconveniences inseparable from rapid expansion, population arriving faster than accommodation can be provided, more cars for less parking space.

Alberta oil developments naturally find a happy reflection in public finance. With the exception of $2.5 millions borrowed in 1947, the Alberta government has borrowed no money since 1935, and is well on the way to becoming debt free.

In the past three years $21,650,000 of the provincial debt has been paid off, $20,400,000 last year. $24,191,000 was saved under the year's reorganized debt retirement plan. The remaining funded debt amounting to $89,008,000 should be wiped out by 1973 through capital payments of about $5,000,000 a year.

Income from natural resources, principally oil, is now higher than that from taxation, for the first time in Alberta's history. Although there was no tax reduction last year, no new taxation was necessary. The only taxes now levied in Alberta are on amusement, liquor, gasoline and automobile registration.

Before discovery of the Leduc oil field in February 1947, annual revenue to the government from oil was about $1 million. In the fiscal year 1949-50 it was $32,370,000. In the less than four years since the Leduc discovery the provincial treasury has realized $77,213,000.

Revenue of these dimensions also has its effect on public spending, on services, debt retirement, capital construction, assistance to municipalities, et cetera. But for revenue

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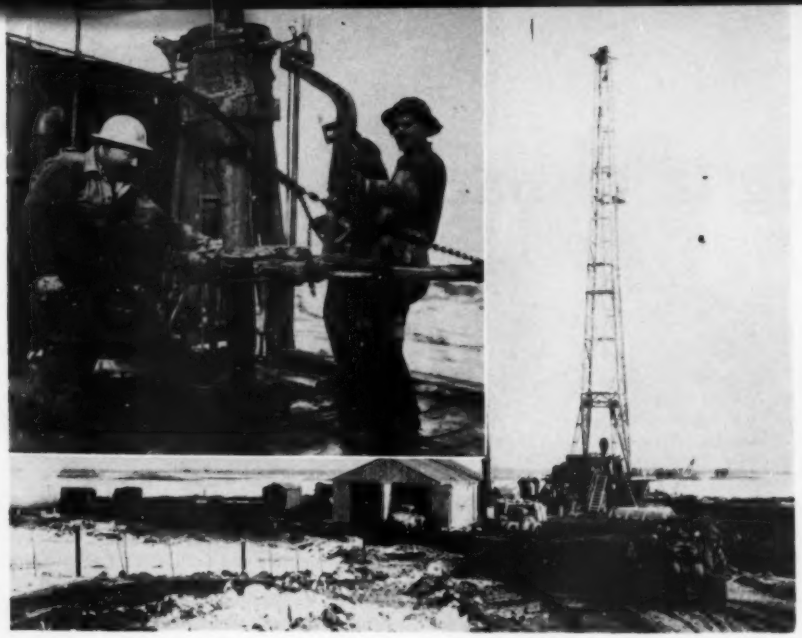


Drilling in the Leduc field. Imperial Oil photo.

Making ready for drilling, Golden Spike field.

from oil, on the other hand, essential capital construction would have to be curtailed or resort taken either to increased taxation or public borrowing.

Last year the government set up a $5-million fund from which the municipalities obtain low interest loans to finance water and sewage systems and other self-liquidating projects.

This year Canadian sources are expected for the first time to supply about one-third of the billion dollar gasoline demand. It is estimated that the consumption of oil for domestic heating purposes last year was nearly 12 million barrels.

Motor vehicles consume about 40 percent of all petroleum products.

There are now between 500 and 600 diesel burning locomotives on Canadian railways as compared with 100 or so in 1945. These burn between seven and 7.5 million barrels a year as compared with two million five years ago.

On the farm front it is estimated there are now about 450,000 oil-driven tractors whereas at the time of the 1941 census there were around 160,000.

The effect of this increased consumption on the dollar situation is an estimated saving of $109 millions or more annually in the prairie provinces alone. When Alberta oil, pipe line-borne, reaches the Ontario market next spring a further saving of $30 millions to $40 millions is expected and ultimately, as full capacity of the pipe line is reached, some $175 millions.

In addition, expansion of the market for fuel oil is having a noticeable but not yet computable effect on Ontario's importation of United States coal.

That the oil economy of Canada is for all practical purposes the oil economy of Alberta is a proposition which no one will contest. Nor could the focal point in the Canadian oil scene have been anywhere but Alberta where the incentives to development are either present or capable of cultivation.

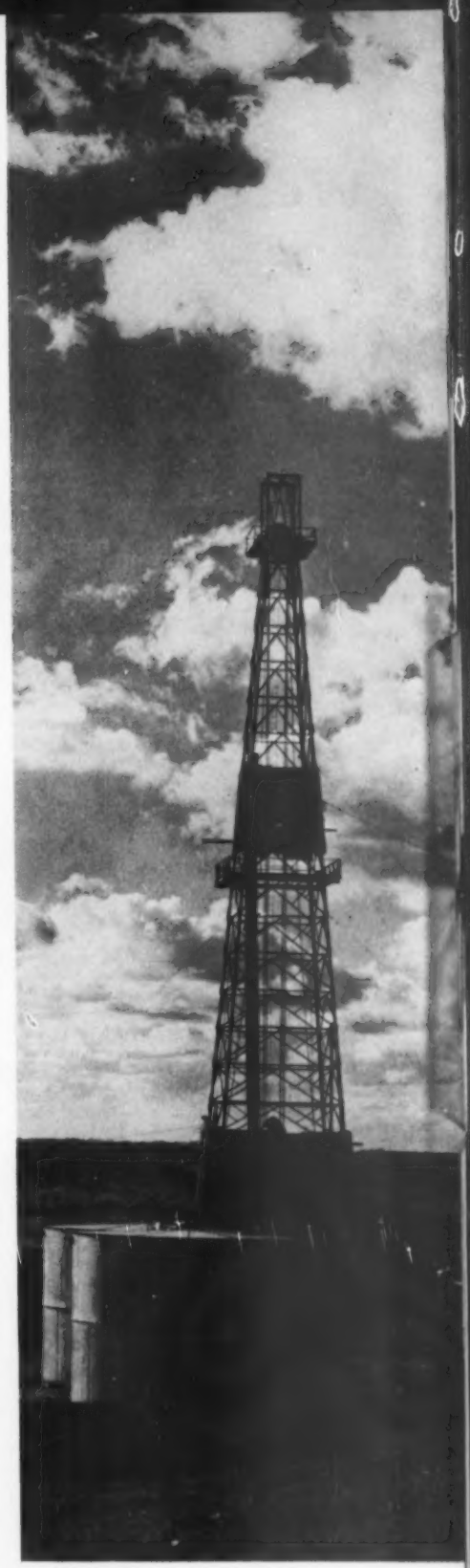
First, the incentive of profit. Not that the operators are becoming fabulously wealthy overnight; at present more of their money is going into the ground than they take out of it.

The second incentive is suitable territory, and the oil bearing areas of Western Canada have been estimated at 800,000 square miles.

Thirdly, a favorable "political climate," as it has been called. Apostles of public ownership have pretended to be shocked by the Alberta government's making a fetish of individual enterprise. But the fetish has paid rich dividends, and now the sharpest criticism to be heard is that the policy admits foreign capital to develop a native resource. In the idiom of the day: So what? Is it not better to invite foreign capital than that a resource should not be developed at all?

The fourth incentive is markets or the means of access to them. Until recently all the Alberta oil fields could be expected to do was sell some part of their output in local markets. As production multiplied the volume became too great for the Alberta refineries to handle, and some part of the product went to refineries outside the province. But the cost of tank car transportation, if continued indefinitely, would have resulted if not in a prohibitive then at least in a burdensome cost to the consumer. The answer was the Interprovincial pipe line now operating.

It is obvious that exploration for new markets is second in importance only to exploration for the oil itself, for unless markets are found capital dries up. On the other hand, with each new discovery the pace of exploration quickens until, as is rapidly becoming the case, it reaches into hinterlands remote from immediate markets, where roads have to be built where there were no roads before and buildings erected to house stores and personnel and storage facilities provided. All of this adds to the cost and G. L. Stewart, president of Imperial Oil Ltd., has predicted that some of these remote areas may require expenditures of $20 millions to $50 millions before a single barrel can be piped to market.



Imperial Redwater No. 1. Imperial Oil photo.

Well Surveying In Canada

ALTHOUGH the first program for the electrical surveying of oil wells in Canada was put forward in 1939 the outbreak of war in Europe caused it to be abandoned and it was not until 1946 that the work actually got under way. In November of that year the first Schlumberger electric logging truck arrived at Lloydminster. A second crew reached Calgary in the following month. As will be remembered the great Leduc field was discovered early in 1947, thus attesting the foresight of the company in extending its operations to Alberta.

Since the Leduc discovery the main problem before the Schlumberger organization in Canada has been one of orderly expansion. For the individual a first consideration is that of keeping warm and in trim to carry on his work in the extremely low temperatures sometime encountered. In the severe winter of 1949-50 one party reported that during a period of 14 days the highest recorded temperature was 40 below zero. In such conditions plenty of warm clothing is a necessity. Ears and noses will freeze if exposed; fur-lined boots and helmets are the rule.

Schlumberger field men spend a considerable portion of their time in their trucks and automobiles, and steps must be taken to combat the hazards of winter travel. The radiator must be filled with practically pure antifreeze. Ordinary heaters must be discarded in favor of those of high capacity or the men will be cold all the time. In extremely cold weather frost quickly forms inside on all glasses, cutting off the drivers' vision in every direction. This is prevented by applying frost shields to the inside surfaces of all glasses. The frost shield is a layer of glass applied over the original glass leaving a thin layer of dry air trapped between, and this air is electrically heated. Glasses covered with these shields remain transparent even in the coldest weather. After these precautions are taken, the man on the well must start the engine of his car frequently to keep the oil fluid. An engine that stands overnight without some running may be very troublesome.

Roads are icy in winter and the men must travel with extreme caution. They must keep constantly in mind that gasoline stations can be long distances apart, and that they can easily run out of gas between them, not a safe thing to do in a blizzard. The high winds and deep snow give rise to frequent drifting of roads. These drifts can very quickly stop all vehicles, stranding them along the roads. Several days may elapse before the plows can open a pathway, and they may drift again as soon as the plows pass. To guard against such hazards, field men usually carry canned foods and emergency rations in the trucks and cars, and some hide away extra cans of gasoline.

The truck and its operators must always drive to the well, but sometimes the engineer can avoid driving the longer and more hazardous trips. Before the base was established at Peace River, an engineer having a well to serve in that region would leave Edmonton by Canadian Pacific plane a day behind his truck. He would arrive in Peace River just in time to meet the truck and make his survey, returning quickly and comfortably to Edmonton by plane. Traveling alone by automobile, this would be an arduous and somewhat hazardous trip for him. If he has a well near Medicine Hat in the southeastern part of Alberta, he can go by Trans-Canada Airlines and do the same. If he has a well in Manitoba, he may be able to ride the train to some point on the railway near the well location where he meets his truck. After the survey he returns to his office comfortably by rail.

After the field men have learned to survive in winter, they find that the successful operation of their equipment presents some new problems. After the hazards of moving the trucks and cars across country in winter the operators sometime find that when they are in place at the rigs, problems are involved keeping them in operation.

In the coldest weather gasoline lines and air lines may freeze, due to condensation of water vapor. This is combatted by adding alcohol. The greases in the driving mechanisms sometimes get so stiff that the connections are broken trying to operate them. To combat these effects, after the truck is in place at the well, a heavy canvas skirt is attached to the bottom of the truck body. This skirt reaches to the ground and when snugly fastened prevents the circulation of cold air beneath the truck. This keeps the mechanisms from getting too cold and helps to keep the working quarters for the crew warmer.

From the very first a tough winter problem has been to keep ice from forming on the cable measuring wheel. This is a small wheel over which the cable coming from the well rolls as it is wound on the receiving drum. The motion of this measuring wheel drives the survey recorder and synchronizes the survey film with the instrument in the hole. Icing of the wheel cannot be permitted since it would cause irregular motion of the films and give incorrect results. This problem has been solved by building a metal jacket around the whole measuring wheel assembly and then passing a metal tube through the jacket. The hot flame of a propane torch is projected through the tube, and the heat from this tube is sufficient to keep ice from the measuring wheel.

These are good examples of equipment operating problems that are typical of western Canada. Rigorous roads and operating conditions constantly take a heavy toll from the trucks and equipment. Maintenance problems are thus more formidable than in most other regions. Special emphasis must be placed on well-equipped shops staffed with good mechanics.

Some unusual seasonal problems are encountered in moving equipment. North of Edmonton lies the muskeg country, a large area covered to varying thicknesses with bog. Oil prospecting and drilling is advancing rapidly into this belt, and activities must be carried on in the winter while muskeg is frozen. In the warmer months the muskeg melts and becomes fluid so that equipment might sink out of sight. An operator must thus move in, drill the well, make all surveys, complete the well, and move the equipment out, all during the winter.

Another period of the year that presents some unusual transportation problems is the thawing season. During this time which may last up to several weeks, the frost comes out of the road beds causing them to be plastic and incapable of supporting heavy loads. The provincial authorities customarily close the roads to truck travel during the thaw season. But drilling goes ahead. Sometimes the government authorities will give a special permit to move a truck on the roads during this closed season. If this can be arranged at all, the truck must usually move during the late night hours while the road bed is frozen from the overnight drop in temperature. But usually it is not possible to get travel permits. In some cases, if the drilling well is reasonably close to rail head, the survey truck may be shipped on a flat car to the area and some means then found to get it to the well. In some cases, the well just cannot be served during this season.

Western Canadians rightfully believe that Sunday should be a quiet day of rest. Alberta law does not permit the operation of heavy trucks on the highways on the Sabbath. By planning ahead, service can usually be provided to most drilling wells without delays from this reason.

The first trucks in Canada offered electrical surveying percussion side wall coring, depth determinations, and geophone surveys. Gun perforating on a limited scale was started early in 1947. Since that time the services have expanded to include temperature, gamma ray, dipmeter, section gauge, "micrologging"*, and photoclinometer. Seven structural exploration survey units are kept busy serving core drilling projects.

Western Canada belongs to the hard rock country. The most important oil production comes from limestone formations. Interpretation of electrical surveys presents all of the difficulties well-known and common to hard

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* Registered U. S. Patent Office

Shot hole drilling in seismic exploration, Alberta.

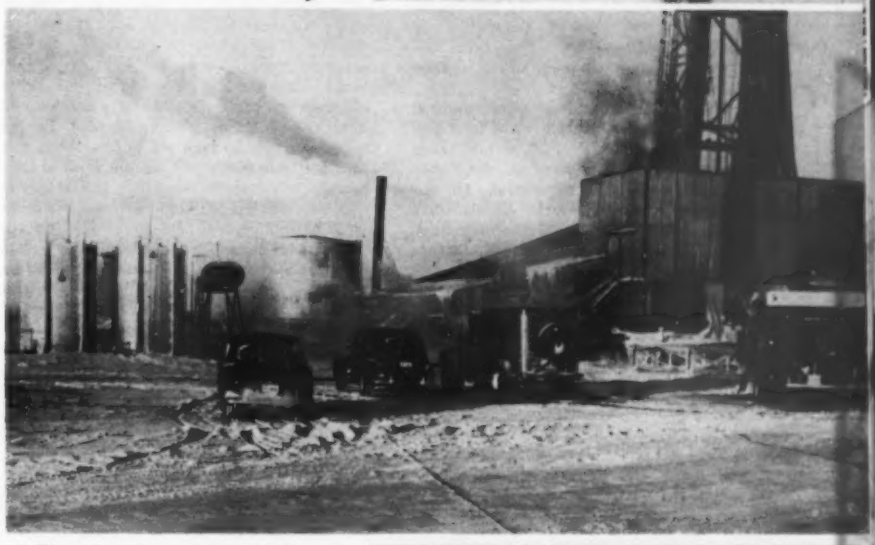
Winter exploration — joining seismograph cables by connectors.

rock country. The introduction of auxiliary services like "micrologging" have gone a long way toward improving interpretations.

Wells are usually drilled carefully and with good muds. This is a break for the field crews because it allows them to get their survey instruments to the bottom of the wells without much trouble and delay. Salt beds (which play havoc with electrical surveys) occur in only a few small areas.

It should be added that the severe cold that has been referred to applies only to the weather. One does not remain in the country long until he feels the warmth and friendliness of the people. The population of the western provinces is made up mostly of wheat farmers and ranchers. These prosperous folk watch the oil development with pride and considerable profit, but they do not let it interfere with their work of raising cattle and wheat.

Some of the best hunting and fishing country in North America is found in Western Canada. The Canadian Rockies are famous for their beauty the world over, and Banff and Lake Louise can be reached in a few hours. All of these features make Western Canada attractive to the oil service company man.



Drilling rig with survey trucks in foreground.

Schlumberger office at Redwater.

Fitting skirt to SWSC truck in Alberta.

Economic Exploitation of Tar Sands Possible in Present Markets

DEVELOPMENT of the vast bituminous sands of northern Alberta commonly known as the Athabasca tar sands is now approaching economic feasibility according to a detailed report recently filed with Alberta Ministers of Mines and Minerals, Public Works and Labor by S. M. Blair of Toronto, an engineer associated with Bechtel Corp. and Universal Oil Products Co. Methods have been developed and proved by means of which oil can be produced at a reasonable cost from the sands and completion of the Interprovincial pipe line from Edmonton to Lake Superior has helped to minimize the geographical disadvantages which previously worked against development, he reports.

Based on careful estimates of mining, processing and transportation costs it is calculated that distillate from the tar sands can be delivered to the head of the Great Lakes at a cost of $3.10 per barrel. On the basis of today's oil markets the distillate has a value of $3.50 per barrel to the oil refiner for the production of gasoline and No. 2 furnace oil.

Scene of the mining and oil separation operations on the Athabasca river is about 225 miles from Edmonton. The Blair report suggests that an 8-inch pipe line be laid to Edmonton to deliver 20,000 barrels of oil daily to the Interprovincial system. Such a line would traverse undeveloped territory, much of it muskeg and difficult for pipe line laying, but not impossible. Such a line would cost $5 million and it is estimated that a tariff of 28 cents a barrel would pay operating cost and amortize the investment in 20 years.

From Edmonton to Superior, Wisconsin, the pipe line transportation cost would be 55 cents per barrel. To this would be added 19 cents to cover storage and other incidental charges in addition to direct line costs, making the total transportation expense to the head of the lakes $1.02.

The Fred Mannix Co. of Calgary which has had a great deal of experience in strip mining of coal in Alberta, has made a special study of the cost of removing overburden from the tar sands and conducting an open-pit mining operation. It was concluded that sand could be delivered to the processing unit at a cost of 55 cents per barrel of finished distillate.

Estimates by the Mannix interests also were based on an operation able to deliver sand in sufficient quantities to produce 20,000 barrels per day of finished distillate over a 15 to 20 year period. To do this it will be necessary to handle over six acres per month of a 60-foot bench.

It was not difficult to find a suitable site for an operation of this scope along the 100 miles of sand outcrops along the Athabasca river. The full extent of the tar sands is not known today. Early surveys reported that the deposits covered an area of about 1,500 square miles while some later studies have suggested an area as great as 30,000 square miles. Some of the deposits have too great an overburden and too thin a section to permit mining in the near future although none of the area carries an overburden of more than a few hundred feet. Outcrops with a sand depth of up to 200 feet and drillings have shown some sections with an oil content of 100 to 200 million barrels per square mile.

Underground mining was considered also by the Mannix interests to eliminate the removal of overburden. This would permit year-around mining even in the sub-zero temperatures. Another method would be recovery of oil from the sands in place to eliminate handling the enormous tonnage of sand. Further research would be required to accomplish this. For the immediate future open pit mining is considered most feasible. Initial capital cost of open pit mining has been estimated at $1.93 million.

Characteristics of bitumen oils differ greatly from crude petroleum from most oil fields and also from shale oils. The oil is highly viscous with an API gravity of about 16°. Initial boiling point ranges from 146 to 159°F. depending on processing conditions. Sulfur content is four to five percent. It is distributed throughout the oil except in certain cyclo paraffins. Some heavy minerals such as vanadium, silver and nickel are found in the distillate. The high sulfur content requires special processing and on the basis of current operating procedures constitutes approximately half of the cost of processing the oil. Further study may be required to devise methods of removing the minerals.

In general the processing steps required have been thoroughly proved in pilot plant operation. The Bitumont demonstration plant* has been producing 500 barrels per day of crude bitumen oil from adjacent deposits. This plant has extensively studied the hot water method of separating oil from the sand and clay. The research has shown that when a mixture of bituminous sand and water is heated the oil separates and disperses in small flecks which can be collected on the surface by flooding with excess hot water. The quartz sand preparation is easier than the separation of oil and clay. The Bitumont plant has shown that the hot water process can be carried out on a large scale in a routine operation. Present plan is to employ separation units of 2,000 barrels capacity each.

The National Research Council of Canada and Universal Oil Products Co., Chicago, have conducted extensive research into the possibilities of employing the fluidized technique for recovering oil from the bituminous sand or from the separated bitumen. The fluidizing method is applicable, Mr. Blair reports because the crude bitumen is never wholly free from mineral solids or from water and pipe still processing presents difficulties. Fluidizing permits continuous production of oil from wet bitumen. The oil produced is water-free and has the following properties:

Specific Gravity 0.960
Viscosity at 100 deg. F...52 Kinematic Centistokes
Sulfur .....4 percent
Distillation 50 percent
over at .....650 deg. F.
Asphaltene Content ....0.5 percent

The fluidizing operation of the bituminous sand distilled off the oil immediately. Bituminous lumps broke down into individual grains which were then partly coated with coke. The oil underwent some cracking but good yields of a less viscous oil were obtained. Net yields were 84-86 percent by volume.

Fluidizing of wet bitumen from the hot water separation process showed that coking and simultaneous dehydration was possible with a liquid yield of at least 83 percent by volume, coke yield of 8.02 percent and a process gas yield of 250 cubic feet per barrel of bitumen.

The distillate as recovered in the fluid plant is not suitable for refining in ordinary petroleum refineries because of the high sulfur content. Mild hydrogenation of the oil to separate the sulfur as H_2S is currently proposed as the best method of preparing an oil which will be satisfactory. The Mines Branch is constructing a plant to study basic factors involved in both high pressures and milder operation.

Estimates have been prepared as to plant investment and operating costs of the mild hydrogenation method of sulfur removal. The hydrogenation plant to process 20,000 barrels daily would cost $7 million and the hydrogen preparation plant $3 million, operating cost would be about 80 cents per barrel of product.

Some attention has been given to the possibility of obtaining a process credit by the production of sulfur for western Canadian requirements. It is estimated that the 20,000-barrel unit under consideration could produce 140 tons per day of sulfur at a cost of $8.50 per ton. This is about equal to the current consumption in western Canada. It is thought that transportation cost would be too great from the plant to eastern Canada where most of the consumption is centered. The area represents an impressive sulfur reserve. A single square mile studied for the Blair report contains 1.5 million tons of sulfur.

To conduct the mild hydrogenation of bitumen oil it has been calculated that 1,000 cubic feet of hydrogen will be required per barrel of oil. Manufacturing cost of the hydrogen would be 25 cents per thousand feet.

Laboratory scale experiments have been made in hydrogenating the coker distillate from bitumen which reduced sulfur content from 4.06 to 0.26 percent. Olefin content

(Please turn to page 110)

*World Petroleum, Dec. 1949, Pg. 40-45

Imperial Plans Broad Expansion

Imperial's new 10,800-barrel refinery in Winnipeg, Manitoba.

MOST important steps on the part of Imperial Oil Ltd. in the development of Canadian oil facilities have been the completion of Interprovincial Pipe Line, in which it shares ownership with other large companies, and noteworthy additions to its refining capacity based on the broadening availability of crude supply which the pipe line has brought about. At the same time the company has enlarged its exploration and drilling, having put down some 400 wells in the western provinces with discoveries that may lead to the development of several new fields. This phase of activity will be further increased during the current year and will require a probable expenditure of $200 million.

Expansion of processing facilities has included the erection of a new refinery at Winnipeg, Manitoba, to serve the growing needs of that province. The refinery has a daily throughput capacity of 10,800 barrels and will operate on Alberta crude drawn from the Interprovincial pipe line. Main elements in the plant are the atmospheric distillation unit and the catalytic cracking installation. The general design and layout was the work of Imperial's engineering and development division. Process design for the fluid catalytic cracking unit was provided by Universal Oil Products Company while construction was handled by Canadian Kellogg Ltd.

A feature of the refinery is the arrangement of units for efficient and economical operation with the flow of feed following an almost straight line from the crude tanks at one side of the plant to product storage on the opposite side. Power equipment, including steam generators, cooling water pumps, compressed air supply and electric substation are grouped in one area. The processing installations, the distillation unit, the catalytic cracker and the central treating plant follow in order with space allowed for subsequent additions but close enough together to minimize piping connections. The fractionating towers, condensers and exchangers are on a line parallel to the pump houses and close to them, reducing the length of piping and pump section lines. Heaters for the combination atmospheric and vacuum distillation unit are of the up-fired Petro-Chem design. The central treating plant will handle natural and cracked naphthas and middle distillates.

The power plant has a generating capacity of 100,000 pounds steam per hour. An unusual feature of the plant is that the boilers are placed outside the utility building but so arranged that they can be fired from within. Cooling water for the process units is supplied through a closed system with a cooling tower. It will handle some 12 million gallons per day and is connected with a Dorr oil-water separator to remove silt, condition the water which is drawn from the nearby Red River and at the same time avoid the risk of river pollution.

An adjunct of the refinery is the 75-mile pipe line which will supply it with crude withdrawn from the Interprovincial line at Gretna. The line is operated by Winnipeg Pipe Line Co. Ltd., a wholly owned subsidiary of Imperial. It is equipped with 10-inch pipe which was imported from the United Kingdom and can handle 14,000 barrels of crude per day, but is capable of being raised to 30,000 barrels by the addition of more power to its present single pump station at Gretna. The line cost $2.5 million to build and was completed between June and December of last year.

To meet the demand for high test gasoline in the western market Imperial has decided to install improved processing equipment in its Edmonton refinery. The additions, contract for which was placed with Foster-Wheeler Ltd. in December, will be a 10,000 B/D fluid catalytic cracking unit with auxiliary gas recovery plant and an 8,500 B/D vacuum distillation unit.

The two units are part of a program estimated to cost $5 million. The new equipment will increase production of high-octane gasolines, but will not add materially to the refinery's capacity or number of employees.

The cat cracker to be placed in the plant will be the first of its kind in the world. Design by Standard Oil Development Co. has been subjected to exhaustive tests and is said to be simpler in operation and more efficient than its prototypes. Construction is scheduled for completion in the summer of 1952.

A major expansion and modernization program has been announced for Imperial's refinery at Sarnia, Ontario. When completed, probably by the end of 1952, Sarnia will have a plant of 71,000-barrel-a-day capacity designed to process Alberta crude oil in equipment of the most up-to-date type. Present capacity of the refinery is 55,500 barrels a day.

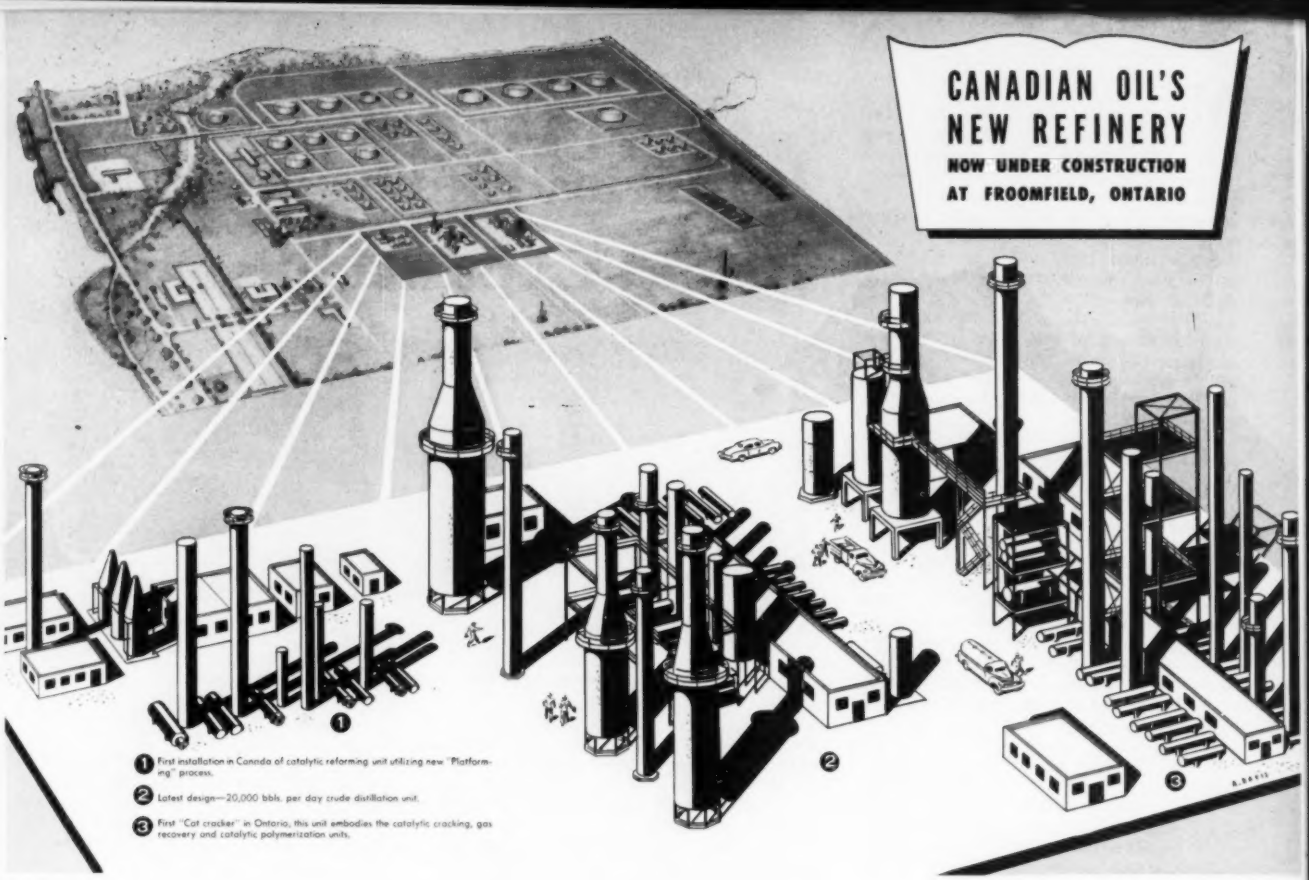
Plans for the new installations call for a 46,500-barrel-a-day atmospheric and vacuum distillation unit, a 23,250-barrel-a-day fluid catalytic cracking unit and a light ends recovery plant. The new units, along with increased boiler and water circulating capacity, will replace and augment existing facilities. The atmospheric and vacuum unit in which the first step is taken in processing crude oil, will be the largest single refining unit in Canada. The cracking unit is a new simplified design and will be the largest "cat" in the country. Cost of the work is estimated at $14 million. With the extensions now under way Imperial's refining capacity will be well over 200,000 barrels daily as follows:

Refinery	Daily crude capacity
Ioco	12,000
Calgary	9,200
Edmonton	26,700
Regina	20,000
Sarnia	55,500
Montreal	44,000
Halifax	22,000
Normal Wells	1,250
	184,650
New Construction	
Winnipeg	10,800
Sarnia	15,500
	26,300

Pipe laying on Gretna-Winnipeg line.

CANADIAN OIL'S NEW REFINERY

NOW UNDER CONSTRUCTION AT FROOMFIELD, ONTARIO


1 First installation in Canada of catalytic reforming unit utilizing new "Platforming" process.
2 Latest design—20,000 bbls. per day crude distillation unit.
3 First "Cat cracker" in Ontario, this unit embodies the catalytic cracking, gas recovery and catalytic polymerization units.

ON what was farmland four months ago Ontario's first fluid catalytic cracking unit is rising along the flat shores of the St. Clair River. There, at Froomfield, four miles from central Canada's oil capital of Sarnia, Canadian Oil Refineries Ltd. has started building an $18,000,000 refinery. The firm is a wholly-owned subsidiary of Canadian Oil Companies, Ltd.

Five hundred miles to the east, at Montreal, a $2,000,000 plant to manufacture greases and blend lubricating oils has been under construction for a year and is nearing completion.

North 100 miles from Sarnia, final touches are being applied to a new marine terminal at Parry Sound, on Lake Huron. It is the fourth Great Lakes marine terminal for Canadian oil, which also has terminals at Toronto and Hamilton on Lake Ontario, at Fort William on Lake Superior and ocean tanker terminals at Montreal and Quebec.

Two thousand miles to the west, in the oil boom city of Edmonton, Alberta, a new marketing plant began operating near the year-end.

At Moncton in New Brunswick, at Montreal, Toronto and other cities key units of the company's 3,500 marketing outlets across Canada have been expanded and modernized.

The rumble of site-clearing bulldozers, the rat-tat of riveters and the clank of hoists in those far-separated centers symbolizes the dynamic growth of Canadian Oil Companies, Ltd. which reaches its 43rd birthday this year. The firm traces its origin back to the first years of the century, to parallel the development of the automotive industry.

The story being written in steel, timber and cement in a dozen cities of Canada is matched by the austere figures of the balance sheet. Shareholders of Canadian Oil have just lately been informed that sales and earnings set new company records in 1950, with sales of $38,329,388 as against 1949's $33,818,436 and net earnings of $1,140,453 as compared with $931,181. Since 1945 the company has more than doubled its sales in dollars, net earnings, net per common share, undivided profits, and number of shareholders. In the past year the gallonage marketed was almost 70 percent above the 1945 figure. Capital assets of $21,000,000 increased in 1950 by almost $2,400,000 and will practically double in another year when the new refinery and other plants have been completed.

Canadian Oil's refinery at Froomfield will have a daily throughput capacity of 20,000 barrels of crude oil. Only 16 miles distant and connected by company pipe line with the present docks and tank farm at Froomfield, the company since its inception has operated a 4,000-barrel refinery at Petrolia, Ontario. Situated on a 400 acre site, just south of the city limits of Sarnia the new plant will process 20,000 barrels daily of Alberta crude.

W. Harold Rea, President, Canadian Oil Companies, Ltd.

Stone & Webster Canada Ltd., are project managers. The "cat cracker," being installed by the Canadian Kellogg Company, Ltd., embodies that company's orthoflow design. Kellogg's is also designing and erecting a gas recovery system and fractionating equipment to produce butane and propane gas and will build a catalytic polymerization plant. The platforming process, which employs a platinum catalyst in the reforming unit, will be installed by Universal Oil Products.

The refinery will yield aviation gasoline for Canada's defense program and ingredients to make synthetic rubber at the federally-owned Polymer Corp. plant in Sarnia.

Oil from Alberta fields will reach the refinery by tankers from Superior, Wisconsin, where it will be delivered by the 1,150-mile Interprovincial Pipe Line, in which Canadian Oil has a $900,000 investment. Products of the refineries will be shipped by the company's tanker to its six marine terminals in Central Canada and trans-shipped from them by the firm's tank cars and truck transports throughout the country. Storage tanks for crude and

(Please turn to page 84)

Jumping Pound gas processing plant.

Discovery well, Jumping Pound Field.

Shell Expands Activities In Western Provinces

LAST year's Canadian number (July 1950) of WORLD PETROLEUM told the story of Shell in Canada from its entry into the Canadian market in 1912. Since that report a number of noteworthy developments have taken place in the activities of the company. Among these have been the completion of the new multi-million dollar refinery at Montreal, the completion of the crude pipe line from Portland, Maine, to Montreal, in which Shell is a substantial stockholder, active development of the Jumping Pound field in Alberta together with the construction of a gas processing plant in the field, and the discovery of oil and gas reserves in the Whitelaw field in northern Alberta.

The new refinery at Montreal is now on stream and consists of two topping units with a combined intake capacity of 25,000 barrels per day, a vacuum flashing unit, a 10,000-barrel fluid catalytic cracking unit, thermal cracking and reforming, a gas recovery plant, propylene and butylene polymerization plant, light ends treating plant, a solutizer treating unit for cracked gasolines, and clay treating for various naphthas. A thoroughly modern system of in-line blending of components for motor gasoline and fuel oil, including automatic leading, is installed. In addition the new refinery facilities include 750,000 barrels of new tankage, enlarged steam plant, new maintenance shops and other services.

The refinery will process Venezuelan crudes with low to medium sulfur content. Corrosion protection to permit running sour crudes has been provided.

At Shell's second Canadian refinery, at Shellburn near Vancouver, British Columbia, the major extension has been in the form of substantial new warehouse, filling and loading facilities. Both of Shell's refineries have operated at capacity throughout the year.

Deep Sea Tankers, Ltd., a shipping subsidiary, has continued to operate its three T-2 tankers, carrying for the most part Venezuelan crude. Another shipping subsidiary, Shell Canadian Tankers Ltd., has carried refined products on the river, canal and lake system of Ontario and Quebec, to Shell's sixteen eastern marine terminals, and has also supplied products by tanker and barge along the Pacific Coast. The fleet of the company has been increased by one chartered vessel during the year.

The crude oil pipe line from Portland, Maine, to Montreal is owned by the Portland and Montreal Pipe Line Companies, in which Shell has a one-fifth share. The new extension consists of an 18-inch line which has been laid in parallel with the old 12-inch line. The pump stations have been reduced in number and increased in individual capacity and the whole operation streamlined. Capacity of the new double line is approximately 125,000 barrels a day. Thus the company is assured of a year-round supply of crude oil for its Montreal refinery.

Until recently the Jumping Pound gas field, close to Calgary, has been shut in for lack of a market since Shell discovered it in 1944. In June, 1950, a contract was signed between Shell and Canadian Western Natural Gas Co. for the supply of gas for the city of Calgary. To comply with this obligation, Shell is constructing a gas scrubbing plant in the Jumping Pound field for processing the gas prior to delivery into the gas company's transmission line. Canadian Western already has completed the installation of a 12-inch gas pipe line from the Jumping Pound field to Calgary and at present is proceeding with the initial stage of extending this pipe line westward to Banff. To supply the necessary quantities of gas a drilling program is under way in the Jumping Pound field.

The gas scrubbing plant is being built in two stages by Fluor Corp. Ltd. The first installation will process 25 million cubic feet of gas per day for sale to meet present estimated requirements. The time for a second installation to bring the plant throughput capacity to 50 million cubic feet per day will be determined by future gas demand. The gas scrubbing plant will consist of three major component parts:

The first part is a hydrogen sulfide and carbon dioxide removal plant. The function of this plant will be to reduce the hydrogen sulfide concentration in the gas to not more than 0.3 grain per 100 cubic feet, as well as to reduce the carbon dioxide content to two percent or less by volume. The natural gas, as it comes from the Jumping Pound field contains, on an average, about 2,200 grains of hydrogen sulfide per 100 cubic feet or 3.5 percent by volume and 6.5 percent by volume of carbon dioxide.

The second part of the installation is a gasoline extraction plant, where a sufficient amount of the heavier hydrocarbons will be recovered from the purified wet gas, so as to prevent condensation and deposition of the liquid in the pipe line transmission system.

The third part of the processing facilities is the dehydration plant. The function of this plant will be to remove water vapor from the purified gas to the extent of depressing the dew point of 15°F. so as to prevent the formation of hydrates and condensation of water vapors in the gas transmission system.

In addition to the above main units of the gas scrubbing facilities, there will be a steam generating plant and water cooling system, both serving the entire installation. All parts of the initial plant presently being constructed are so designed that the subsequent installation of additional equipment and increase in plant capacity can be accomplished with the least interruption in plant operations. All major pieces of equipment, such as boilers, heavy vessels, tanks, structural steel, as well as all pipe, valves and fittings required for this project were furnished by Canadian suppliers. It is estimated that the Jumping Pound gas scrubbing plant will be completed and put in operation early in April of this year and will provide employment for a number of people.

In the Whitelaw field, which Shell discovered last May, after completion of Whitelaw No. 1, which is producing oil and gas, a second well was drilled and completed as a gas producer. A third well is now drilling and further tests are planned to determine the extent of the gas and oil accumulation. Shell owns a half share in this field, the other half interest being in the hands of British American Oil Co. Under the agreement with the latter company Shell is presently the operator of the field.

Last year was one of continued expansion by Shell in all phases of its exploration and production activities in Western Canada. An extensive campaign of geological and geophysical work and test drilling was carried out, a considerable part in the northwest muskeg country. Shell holds options, permits, reservations and leases amounting to some 7¾ million acres situated in all four of the western provinces and extending from north-eastern British Columbia down through Alberta and Saskatchewan into southwestern Manitoba. On this acreage Shell is operating a large number of geological and geophysical crews and several strings of drilling tools.

McColl-Frontenac Expands Refining

SPURRED by a record increase in demand for petroleum products, combined with important discoveries and expanding production of crude oil in the Prairie Provinces, McColl-Frontenac is building a complete new refinery at Edmonton, Alberta. The plant has been designed to handle approximately 5,500 barrels per operating day of either Redwater or Leduc crude which will be delivered from the producing fields by pipe lines now under construction.

Costing an estimated $10,000,000 the new Edmonton refinery will utilize fluid catalytic cracking, catalytic polymerization and delayed coking in order to produce a maximum yield of high-value distillate products from the crude oils charged. Design and layout of the refinery is so arranged as to facilitate future expansion when market conditions warrant it, and to provide the flexibility necessary to meet the varying demands of an area which is both agricultural and industrial.

The atmospheric crude stilling unit will separate about 5,500 barrels of crude per day into light and heavy naphthas, kerosine, diesel-oil cuts and heavy gas-oil fraction which will make up a portion of the feed stock to the fluid catalytic cracker. The residual fraction from the atmospheric unit will be 41 percent on Redwater crude or 35 percent on Leduc crude.

The delayed coking unit will consist of a combination cracking and coking heater alternately discharging thermally cracked topped crude into two coking drums. The fresh feed will be 2,239 BPOD of Redwater reduced crude or 1,934 BPOD of Leduc reduced crude, producing approximately 68 or 41 tons of coke respectively. The vapors from the coke drums will be fractionated into a naphtha stream for gasoline blending, a gas-oil charging stock for the fluid catalytic cracking unit and a small amount of heavy fuel oil.

The cat cracking unit, one of the most modern types available, combines the reactor and regenerator in a "stacked" design and has a design capacity of 2,644 barrels per day of fresh feed. The conventional fractionator will produce a cat cracked naphtha for gasoline blending and a light gas-oil for fuel blending. All cat cracked heavy gas-oil will be recycled to the reactor. The light ends recovery section includes an absorber, debutanizer and depropanizer.

The catalytic polymerization unit will consist of a single exchanger-type reactor and will handle a mixed propylene-butylene feed at the rate of 500 barrels per day.

Cracked gasoline fractions from the thermal cracker and coker will be stabilized and treated in a copper chloride sweetening unit. Two additional copper chloride sweetening units are to be used for treating straight run gasoline and middle distillates. Auxiliary facilities at the refinery include a steam generating plant, three-quarters of a million barrels of tankage, an administrative building, testing laboratory, workshop buildings, control house, pump house, compressor building, and an ethyl blending plant. Electric power for the refinery will be purchased.

Ground was first broken in May 1950 and construction is expected to be completed by July 1, 1951. At the present time all material and equipment has been ordered, major foundations are complete, administrative and miscellaneous pump houses and control houses are 65 percent completed and 40 percent of all major equipment has been set on foundations, while the offsite transfer piping is 40 percent installed. Foster Wheeler, Ltd., with Foster Wheeler Corporation acting as sub-contractor, is undertaking the construction of all process facilities. Offsite work is being carried on by Burns & Dutton Concrete and Construction Co. Ltd. The fluid catalytic unit is of Foster Wheeler design and the catalytic polymerization unit was designed by Universal Oil Products Company.

In addition to the construction of the new Edmonton refinery, the final phase of an extensive modernization and expansion program at the Montreal Works is now under way. The initial phase, which began in 1946, saw the enlargement of the Montreal plant from a capacity of 18,000 BPOD crude oil to 40,000 BPOD in 1948. During this period, which was described in detail in an earlier issue of this magazine*, new crude stilling, fluid catalytic and polymerization units were erected and auxiliaries were increased to meet the utility requirements of the enlarged refinery.

In order to decrease the yield of residum the pressure flashing unit is now being increased in capacity from a daily charge of about 19,000 barrels to 24,000 barrels with a simultaneous increase in the fraction flashed off. With the same object in view a larger flash tower has been installed for visbreaker unit operation with an increase in capacity from 10,600 to 12,000 barrels per day and a simultaneous decrease in residual fuel fractional yield.

The former polymerization unit which operated on a mixed propylene-butylene feed stock and produced about 1,000 barrels daily true polymer is being increased in capacity to 1,500 barrels by the addition of two exchanger type reactors holding 5,600 pounds each of UOP catalyst. Improved stabilization is being provided for the production of commercial propane.

Plans for revamping the 3,400-barrel naphtha reforming unit to handle a charge of 4,000 barrels per day have been completed and the required alterations are now under way. In order to take care of the increased utility requirements for the refinery, the boiler house is currently being enlarged by the addition of a 75,000-pound per hour steam boiler operating at 250 psig. Construction work has been completed on three new copper chloride sweetening units. The most recent advances in treater design have been incorporated into these units and the capacities in barrels per day for straight run, thermal cracked and middle distillates are 16,000, 8,000 and 5,000 respectively. A new main transfer pump house recently has been completed to handle the increased requirements occasioned by the expansion of Montreal Works.

Another important unit in the company's expansion program is the new $1,450,000 lubricant blending and grease manufacturing plant which was placed in operation in August 1948. The plant employs the latest equipment and has a production capacity of 10 million gallons of lubricating oil and 15 million pounds of grease annually. The three-story main building, housing the ultramodern laboratory and the major process equipment, is provided with loading platforms where box cars and a fleet of transport trucks can be handled at one time. The plant is located near the waterfront adjacent to McColl-Frontenac's 1,350,000 barrel Toronto terminal which is used in the distribution of gasoline and heating oils to metropolitan Toronto and nearby areas.

John M. Pritchard, president, McColl-Frontenac Oil Co. Ltd.

*See WORLD PETROLEUM, July 1950.

Edmonton works of McColl-Frontenac showing combination unit under construction.

Opening flow valves at B-A's Whitelaw No. 1 in northern Alberta.

British American Enlarges Activities

BRITISH American Oil Company, Ltd. directly and through its subsidiaries, stepped up its exploration and development activities during the past year and has augmented its transportation, manufacturing and marketing facilities in Canada.

In the United States the company's subsidiary, The British American Oil Producing Co., concentrated operations in northeastern Colorado, southwestern Nebraska, west and central Texas, along the Louisiana Gulf Coast, and in California.

As at December 31, 1950, this wholly-owned subsidiary was producing an average of 15,950 barrels of crude oil daily. At that date, the subsidiary operated and owned, in whole or in part, 496 oil and 28 gas wells in 12 states of the Union, as well as having an interest in 881 oil and 35 gas wells in proven producing areas, the latter being controlled through leases and options. Proved developed and undeveloped reserves in the United States at that time were estimated in excess of 70,000,000 barrels. The Producing Company's output for 1950 amounted to 4,635,355 net barrels, compared with 4,495,715 in 1949.

Owing to the gradual improvement in demand for heavy crude oils in 1950, the Producing Company increased its output in the Steamboat Butte and Pilot Butte fields in Wyoming. On completion of the Platte Pipe Line, which will connect these fields with refineries at Wood River, Illinois, and in which British American has a financial interest, additional markets will be opened and production of Wyoming crude will be further increased. In anticipation of this, accelerated development drilling was started in both fields in 1950.

Exploration and development activities in western Canada were accelerated during the year. At December 31, 1950, the company owned or had an interest in 72 wells in the Canadian west. It also had an interest in ten geophysical crews. Acreage under lease and reservations, held either by the company or jointly with others, was more than doubled during the year, boosting the total of 3,400,000 acres.

In conjunction with Shell Oil, British American drilled and completed two wells in the Peace River district in Alberta. The first, Whitelaw No. 1, opened up some 500 feet of gas-bearing sand in the Triassic zone, hitherto unproductive in western Canada. Since no immediate market was available for this gas, the well was completed as an oil producer in the deeper Permo-Pennsylvanian horizon. The second well, Bluesky No. 1, was completed as a gas producer and should prove to be a valuable addition to the company's reserves when gas is freed for export from Alberta.

During 1950 the company's four refineries; at Montreal East, Quebec; Clarkson, Ontario; Moose Jaw, Saskatchewan; and Calgary, Alberta; processed 18,447,781 barrels of crude oil, compared with 13,706,710 barrels in 1949. Sales in 1950 amounted to 681,700,000 gallons, an increase of almost 14 percent over the previous year.

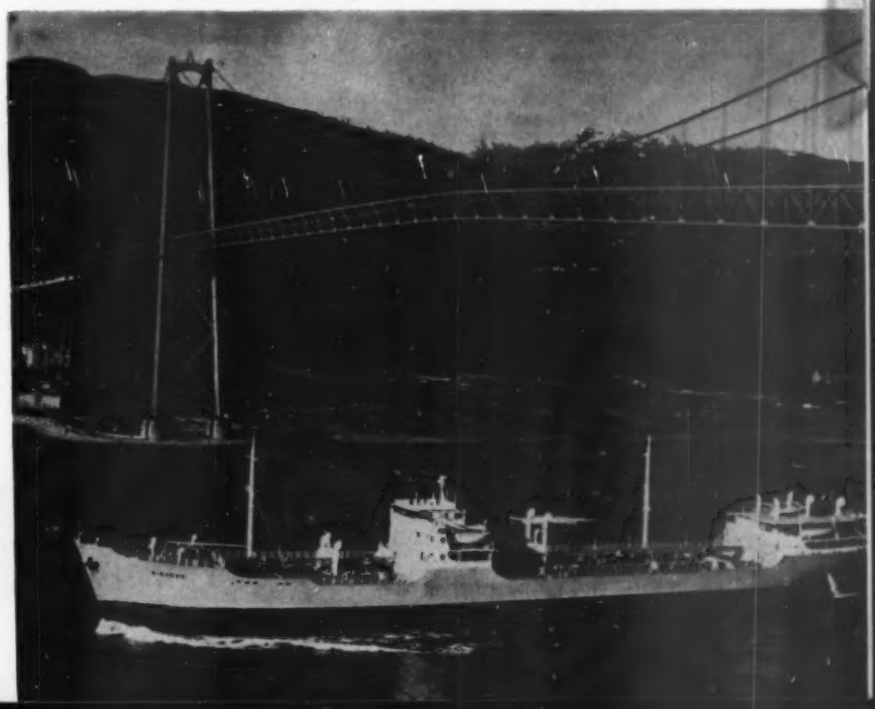
The largest single factor in the company's increased throughput during the year was the completion of the expansion program at its Montreal East refinery. The units at this refinery, which have a designed capacity of 32,000 barrels a day, proved that they are capable of being operated substantially above that figure.

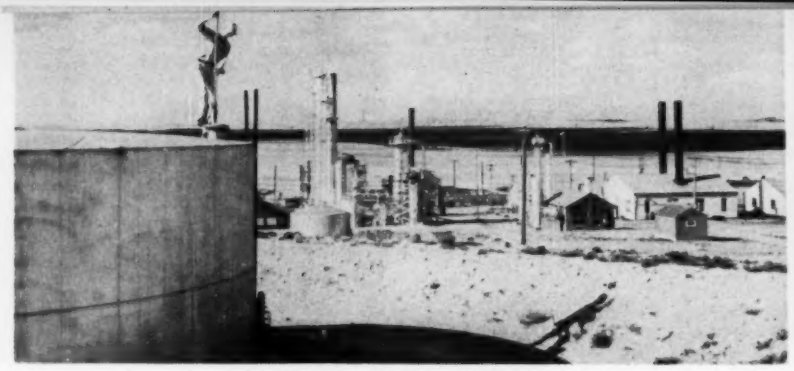
Construction of a new refinery at Edmonton, Alberta, and the expansion and modernization of the company's refinery at Moose Jaw progressed satisfactorily. It is anticipated that the former will be in operation by June, 1951, the latter being scheduled for completion early in 1952, at which time British American's five refineries will have a designed annual throughput of 23,000,000 barrels. In 1940 the company's refinery capacity was 6,500,000 barrels.

The new propane deasphalting plant at British American's refinery at Clarkson was put into operation during the year and now is producing solvent-extracted bright stock, a high quality lubricating oil previously imported from the United States.

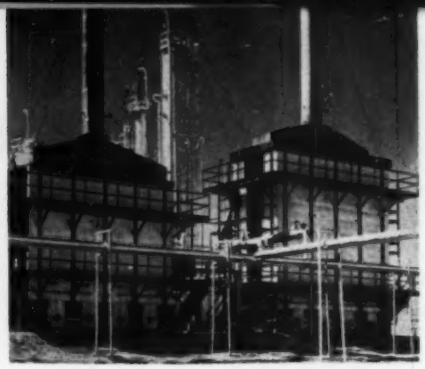
As of December 31, 1950, there were 3,717,046 shares of common stock outstanding held by 21,649 shareholders. The average holding was 164 shares, and no person or institution owned anything approaching a controlling interest in the company. Of the 21,649 holders of common stock more than 96 percent were residents of Canada and they held more than 79 percent of the shares. The remainder of the common stock was held in the British Commonwealth, the United States and other foreign countries. In addition to common stock issued, there were 55,596 shares of preferred stock still outstanding at the end of the year. The current dividend rate on the common stock is $1.00 a share annually, and on preferred stock the current dividend rate is 3¾ percent.

One of B-A's chartered vessels going under the Lion's Gate Bridge, Vancouver, B. C.





Topping, reforming and polymerization units.



Topping and reforming heaters.

U. S. Refinery Will Operate On Canadian Crude

By J. M. Hay*

THE first United States refinery to operate wholly on Canadian crude is scheduled to go on stream at Superior, Wis., terminal of the Interprovincial Pipe Line, on May 1, 1951. The formation of this company, the unique economic conditions fostering it, and the erection of the plant all form another step in the utilization of Canada's recent oil discoveries. With oil companies multiplying and production expanding in the Dominion this is the first entry of Canadian oil into the United States market.

Superior is perhaps the only United States point on the Great Lakes where Canadian crude at present prices competes favorably with domestic production. There are no other crude or product lines running into the area. Therefore, even with the higher wellhead prices, the duty and the carrier charges Canadian crude is less expensive than crude brought in by other transportation facilities. From Superior most of the crude delivered by the pipe line is to be shipped by tanker to refineries in eastern Canada; other United States refineries on the Great Lakes already have crude pipelined to them from domestic oil fields and cannot afford to pay additional tanker transportation costs.

The formation of the Lake Superior Refining Co. is a direct result of the construction of the crude pipe line from Edmonton, Alberta, to Superior. Previous to the erection of this refinery there were no operating refineries within a radius of 150 miles from Superior. The nearest refineries are at St. Paul, Minn. and Sheboygan, Wis., and almost all of their products are sold on their local markets. The entire Superior-Duluth area, with a present market of approximately 12,000 barrels of refined products per day, was supplied by barge, tanker and tank car shipments from Chicago, Toledo, Cleveland and other points. During the months when the harbors were open these requirements were brought in by tanker and barge but during the remainder of the year the whole area was dependent upon tank car and truck transportation. The potential market for petroleum products is large because many industries and individuals could not afford to pay the transportation charges on oil and continued to use other fuels.

At the same time industries in the area were becoming increasingly dependent on fuel oil even at the higher prices. Probably the most important of these is the mining industry in the Mesabi and Cuyuna ranges. The ore is transported by rail to loading docks in Superior and shipped by barge and lake boat to smelters. Recently the railroads operating between the Mesabi range and Superior have converted to Diesel fuel. The larger railroads running into Superior are all operating on Diesel fuel. Obviously, a local source of liquid fuels and lubricating oil is advantageous to local industries and to the individual residents of the area.

Superior itself is dependent to a large extent on the lakeboat shipping business. These boats take on cargoes of ore, as previously mentioned, grains and other commodities. Because of the higher cost of fuel oil at Superior the boats were forced to make an additional stop elsewhere on the Lakes to refuel. By supplying them with fuel oil at competitive prices, allowing them to refuel while loading, it is estimated that the lake boats will be able to make one more round trip per season.

After an extensive study of these economic conditions the newly formed company purchased a refinery from the Carter Oil Co. This refinery, built in 1937, was located at Cut Bank, Mont. It consisted of a 4,000 barrel skimming unit, a 1,200 barrel thermal cracking unit, and a polymerization unit, together with the necessary treating, blending, and utility facilities.

The Refinery Engineering Company of Tulsa contracted to move the plant from Cut Bank to Superior and to have it on stream by May 1, 1951. The dismantling, match marking, and the reerection of the plant was begun on Nov. 1 and carried on during the severe winter conditions prevalent at both job sites. Working through the winter was necessary to meet the crude contract and to have products available for the beginning of the lake shipping season. The plant is being reerected almost on the same plot plan as the original although the product yields will be changed because of the new crude source and different market demands.

The products to be made by the refinery cover a wide range of liquid fuels. During World War II, the polymerization unit was converted from a non-selective to a selective process to produce codimer aviation base stock. This process is being retained because of the present national emergency. Therefore the plant can produce aviation gasoline components, butylene and codimer, together with premium and regular grades of gasoline. The plant will also produce kerosine, diesel fuel oil, Navy fuel oil, and Bunker C. Under normal conditions, much of the fuel oil would be cracked to gasoline in the thermal cracker but because of the large demand for these products, the thermal unit will be used principally to reform the straight run naphtha to higher octane gasoline.

Plans are already being prepared for the construction of a catalytic cracking unit in the very near future. The total throughput will be increased to 10,000 barrels daily and the additional crude necessary will be available. The catalytic cracking unit will also provide an even greater variety of products and together with the increased quantity can supply the bulk of the liquid fuels consumed in the Superior-Duluth area.

It is interesting to note that most of the products the refinery expects to produce initially will be marketed in a very small area surrounding Superior, perhaps in a radius of 70 miles. The plant, by providing a competitive price for liquid fuels, will encourage expansion of existing industries and the initiating of new industries in and about Superior.

Ownership of the refinery is vested in Superior Refinery Owners Inc., of which Howard Underhill is president. It will be operated by Lake Superior Refining Company, C. H. Alberding, president. J. J. Crotser is vice president of both companies.

*The Refinery Engineering Co., Tulsa, Okla.

Growing with Canada

Canadian Oil Companies, Limited

REFINERS AND MARKETERS OF

WHITE ROSE

PETROLEUM PRODUCTS

Now under construction at Froomfield, Ontario, (near Sarnia) is a new $18,000,000 refinery for the company. Also being built at Montreal East, Quebec, is a $2,000,000 oil blending and grease manufacturing plant. These two developments are indicative of the great progress and expansion at present taking place in the operations of Canadian Oil.

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1951 Holds Promise For British Columbia

By Don Tyrell

THIS year of 1951 holds more promise for the oil industry in British Columbia than any other period in the history of the province. Legislation before the Legislative Assembly is expected to end the restrictive laws controlling the prices of petroleum products in Canada's Pacific province. Oil men have consistently refused to enlarge refinery capacity while gasoline prices were controlled by a provincial board.

With price controls on the way out leading oil firms in the province will soon be able to implement plans to increase facilities which are at present unable to meet the requirements of consumers in this area.

Other major developments on the British Columbia scene are the plans of several companies to service the Pacific Coast area with oil and natural gas pipe lines from Alberta. One company, Westcoast Transmission, is already exporting Alberta natural gas through a small line to Dawson Creek in the northern part of British Columbia. This company, one of the first to be incorporated for pipe line export of natural gas from Alberta, already has made application for the right to pipe gas to British Columbia and the northwestern part of Washington via an all-Canadian route.

Enormous natural gas discoveries in Alberta's Peace River area and extension of these areas into British Columbia almost assure enough supplies for the construction of a pipe line. If permission to build the line were given it is estimated that Vancouver could be served with natural gas within a period of months.

The new Alberta gas wells which are only a short distance from the British Columbia border, are Imperial Smoky, Hudson Bay Gas and Tangent, and Pacific Pete's Valleyview No. 1 and Dunvegan No. 1. These discoveries bring the present proven and probable reserves close to the trillion and a half cubic feet considered necessary to maintain a natural gas pipe line in operation for 20 years.

The Peace River district is not considered an economical area from which to service the rest of Alberta with natural gas, being too far removed from populous centers. Gas in this area therefore can be earmarked for export. More gas wells are being discovered almost daily, some of them inside the British Columbia border.

Pacific Petroleum has found gas in six such wells. Sunrise Well, about 20 miles from Dawson Creek, is presently being redrilled but another Sunrise Well south of there has hit a good gas showing. Peace River No. 8, 26 miles up the Alaska Highway, shows signs of proving up as an excellent gas well. Other company wells, Nos. 1, 5 and 6, all in the same locality, have hit gas.

Potential oil and gas areas in British Columbia consist of two districts separated by the Rocky Mountains. Of these the northeastern section of the province adjoining the Alberta fields has been explored as an extension of the Alberta territory.

In the coastal area crude oil and gas were found in the Queen Charlotte Islands (Graham Island) in 1914 at Tian Head. First organized search of the area was undertaken by Royalite Oil which drilled a well to 3500 feet late in 1949 before abandoning it. Conditions found were encouraging and the company intends to continue its search in the area.

Most work in British Columbia in 1950 was of an exploratory nature although 12 wells were drilled in various sections of the province. Of these eight were completed, seven of which were plugged and abandoned while one is standing cased. Exploration work has been confined largely to geological surveys over areas covered by permit. Pacific Petroleums conducted a preliminary seismographic survey in the Flathead Valley in the Kootenay District. This survey, of the reflection type and comprised of two profiles, was done in the early fall.

Phillips Petroleum did considerable work on two permits in the Peace River district. The coring program on one permit included the drilling of fourteen 4½ inch holes for a total of 12,278 feet. On another permit two stratigraphic test wells were drilled. At the end of the year one was still drilling.

In the twelve exploratory wells drilled footage was 34,229 feet in addition to which 17 shallow stratigraphic test wells logged a total of 13,466 feet. One well, Allenbee South Brazeau No. 1, which was sunk only 30 miles from Vancouver, was abandoned at the end of February after reaching a depth of 4700 feet. Allenbee officials, however, plan to continue seismic work in the area.

In the Gulf Islands area, situated between Vancouver and Victoria, Royalite Oil has acquired Crown and freehold rights to property on a number of islands as well as a small section of Vancouver Island. Preliminary surveys have been made of the area.

At the close of 1950 over 10 million acres was under permit in the province. This summer, with oil companies showing renewed interest and restrictive laws ended, should see even greater activity, particularly in the northeastern section of the province where geologists are anxious to probe the possible extension westward of Alberta's proven gas and oil territory.

Disposition of existing permits, licenses and leases is indicated in the government table below.

District	Permits No.	Permits Acres	Permit Applications No.	Permit Applications Acres	Licenses No.	Licenses Acres	Leases No.	Leases Acres
Peace River	70	9,242,189	2	79,120	25	32,000	10	6,400
Queen Charlotte	7	558,917	1	10,000	1	1,195		
Cariboo	13	388,617					1	653
Lower Mainland and Vancouver Island	5	67,727	1	19,807			4	1,242
Kootenay	8	154,826					8	4,131
Yale							3	1,184
Kamloops							2	720
Totals	103	10,412,276	4	108,927	26	33,195	28	14,330

Coleman and Barkley Resign

Ralph J. Coleman, assistant general manager, and Stewart Barkley, chief geologist, will leave their posts with the Mexican-American Independent Oil Co. which pioneered percentage-of-production drilling in Mexico. Their resignations followed by three weeks the resignation of Bart Gillespie, the company's general manager.

The resignations are believed to be part of a general retrenchment plan voted by the directors of Mexican-American's Mexican operation at a board meeting held recently in Oklahoma City. No official announcement of the company's 1951 plans has yet been released but backers of the operation are known to be dissatisfied with the program's lack of results to date.

The latest personnel shakeup came on the heels of the plugging and abandoning of Tortuguero No. 10, the company's last test in the Tortuguero field. It showed salt water in the upper sands and non-commercial gas deposits in the lower sands.

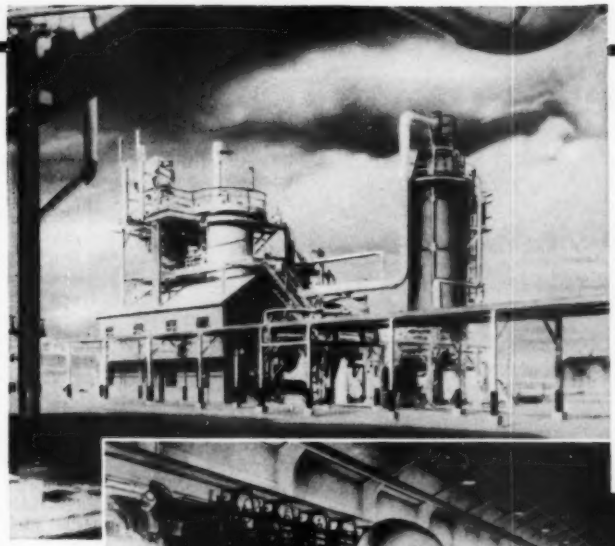
Cima officials in Mexico City had previously declared that if Tortuguero No. 10 turned out to be non-commercial the company would leave the field. It is reported one rig will be moved to a new location at Tecominuacan in the state of Tabasco. The site is not far from Huimanguillo, south of Rosario where Pemex is currently carrying on drilling operations.

New Pipe Dope

A material which remains liquid as long as a stream of air bubbles through it, but which hardens in a few minutes when away from air, has been developed in the chemistry divisions of the General Electric research laboratory. Its properties are thus opposite to those of paint, which hardens when exposed to air. This new material which has been named "anaerobic permafil," is able to penetrate extremely small cracks before hardening. Thus, a possible application is a tight seal for stopping nearly invisible leaks, or a "pipe dope" for sealing threaded unions.

Oil Well Supply Appointments

M. F. Hazel has been appointed as director of engineering of Oil Well Supply Co. and Alex Quayle as chief engineer in charge of all product design. Mr. Hazel has served as Oilwell's general manager of sales since Jan. 1, 1948. Mr. Quayle is chief engineer in charge of product design at Imperial Works, Oil City, Pa. In his new position he will be located at the company's home offices in Dallas.



NOTHING IS WASTED

To insure maximum use of the field, the new Elk Basin Unit Repressuring Plant at Elk Basin, Wyoming, includes provision for recovery of over 90 per cent of pure elemental sulfur from sour gas and the generation of flue gas for repressuring. This releases the sweetened natural gas for sale purposes. Operated for the Unit by Stanolind Oil and Gas Company, the plant recovers propane, butane and natural gasoline from casinghead gas. Design and construction were by Stone & Webster Engineering Corporation.

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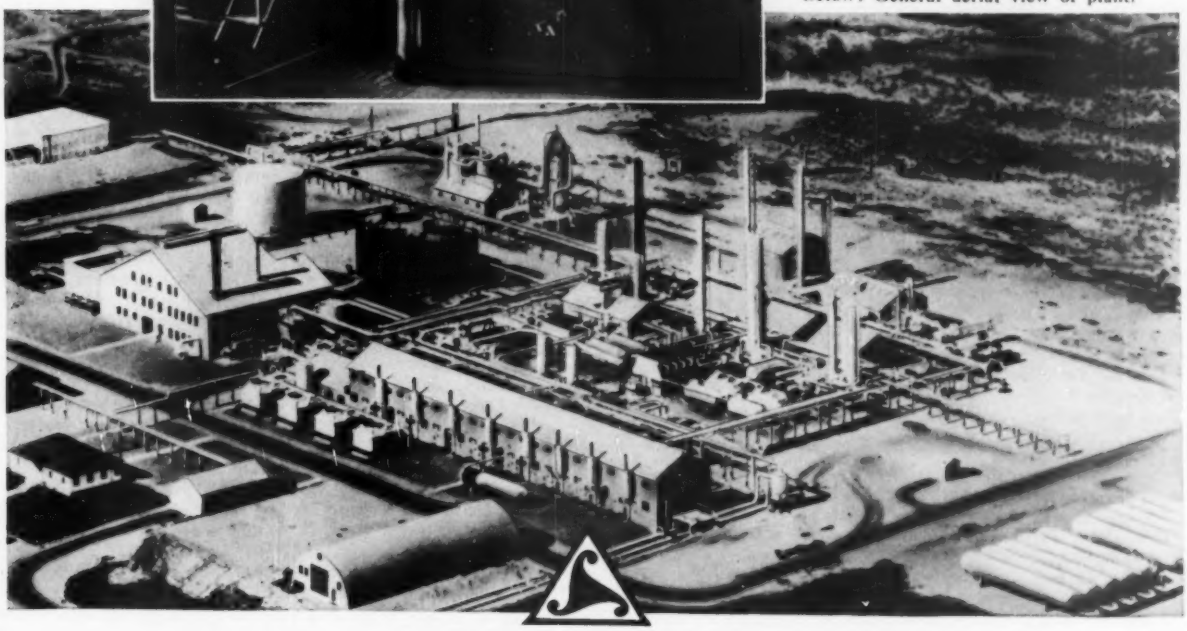
Above: Sulfur Recovery Unit.
Center: Interior of Compressor House showing feed and inert gas compressors.
Below: General aerial view of plant.



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Oil Industry Protests Depletion Cut

By Joseph B. Huttlinger

WASHINGTON

FOR the third time within nine years, the American petroleum industry has had to defend its historic 27.5 percent depletion allowance. As in previous attacks the charge against it, spearheaded by President Truman and backed up by the Treasury Department, is that oil is not bearing its fair share of the national tax burden. This time, however, the attempt is not to eliminate the allowance entirely. Instead the Treasury asked that it be cut to 15 percent, a move designed to take away an estimated $250 million or more annually from oil and gas producers.

In previous conflicts the House Ways and Means Committee refused to tamper with the allowance; oil men are hopeful that the committee, itself, again will reject the proposed change; if not, they plan carrying the fight to the full House and the Senate.

Members of the oil industry feel that the reasons against any reduction in the depletion allowance are more compelling than ever before; first, because of the urgent necessity of finding and producing more oil in the preparedness emergency and, second, because the costs of exploration have greatly increased and the results from such efforts have steadily diminished. This position is powerfully supported in the report prepared at the request of the Interior Department by a committee of the National Petroleum Council with Dr. R. E. Wilson, head of Standard Oil Company of Indiana, as chairman.

NPC was requested in January by a letter from H. A. Stewart, director of Interior's Oil and Gas Division, to report on the possibility of increasing daily crude output by a million barrels, this figure being assumed as a basis for determining requirements in the way of capital and materials. In an interim report issued early in March the committee stated that to maintain production at its present level of around six million barrels would require a steady increase in exploration and development and added that a reduction of the present depletion rate would curtail both. If the depletion allowance had not been established, the committee reported, there would have been less exploration, with consequent much lower reserves and producing capacity, higher product prices and greater dependence on foreign sources of supply. Pointing out that the Treasury's proposal would bear most heavily upon the smaller companies and independent operators who, as wildcatters, have discovered a large percentage of the nation's oil resources, the report said "Many operators would be thrown into bankruptcy or forced to sell their holdings at sacrifice prices" and added that it would deal a death blow to many secondary recovery operations with consequent loss of millions of barrels of oil.

Questioning the Treasury's claim that a cut in depletion would add substantially to federal revenues the committee held that by reducing exploration and drilling it would involve losses of income in many directions and would be unprofitable from the fiscal angle as well as disastrous in other ways.

The same arguments, amplified in detail, were presented at the hearings of the House committee by representatives of all branches of the oil industry. Among those who were heard by the committee was Lieut. Gen. Ernest O. Thompson of the Texas Railroad Commission who told the Congressmen that the country's oil supply position was too tight to permit any tampering with incentives to the discovery of more oil. Referring to the possibility of greatly increased production to meet a war emergency Gen. Thompson said: "It is not too much to say that petroleum protects freedom. Our tanks, our ships, our planes and trucks all require petroleum. If we are to remain free, we must remain strong. Petroleum propels the machines of defense, and it protects freedom. Make sure that our industry is able to keep us all well supplied."

Gen. Thompson saw inconsistency in the drive against the depletion allowance on the one hand, and the proposal to spend $300 million to get 30,000 barrels daily of oil synthetically. Rollback of the depletion allowance would bring in not more than $300 million, according to government estimates, said Thompson, "But there is no question that if the law is changed, the drop in oil production in this country will fall many times below the 30,000 barrels daily which might be obtained from the synthetic plants."

S. A. Swensrud, president of the Gulf Oil Corp. told the committee "The depletion allowance has become as much a part of oil production as the rotary rig." Russell B. Brown, counsel to the Independent Petroleum Association of America, declared the principle has become "so valuable as an incentive to the search for oil that I shouldn't be surprised some day to hear the Russians claim they invented it."

Among others testifying were R. B. Anderson, Vernon, Texas, president of Texas Mid-Continent Oil and Gas Association; Charlton Lyons, independent producer of Shreveport, La.; James H. Upham, Mt. Vernon, Ohio, president of Ohio Oil and Gas Association; O. C. Bailey, El Dorado, Ark., chairman of the Arkansas Oil and Gas Commission; W. H. Geis, Los Angeles, representing three oil trade groups, Wesley Disney, Tulsa, counsel for the Independent Natural Gas Association of America; B. M. Heath, independent producer of Carmi, Ill.; Arthur C. Simmons, Bradford, Penn., representing National Stripper Well Association; Knight Thornton, stripper well producer of Wellsville, N. Y., and Glenn E. Nielson, Cody, Wyo., representing Rocky Mountain Oil and Gas Association.

Some two score oil men including representatives of major companies, independent individual operators and officials of trade associations appeared in person or filed statements opposing any change in the depletion allowance. The presentation covered every phase of industry operation and was probably the most comprehensive and convincing exposition of the subject that ever has been made in public hearings.

Coincident with the discussion of depletion Interior Secretary Oscar Chapman opened renewed drive for creation of a commercial-scale synthetic petroleum industry, operating from coal and oil shale. Further, he told a secret session of the House Commerce Committee that he has all the powers he needs, for the first time, to do just this under the Defense Production act. In a public report, he stated that he is asking all private companies interested in undertaking such projects to submit their proposals to him.

Interior officials explained that Secretary Chapman is considering several oil-from-shale projects and two large plants to make petroleum products from coal. They estimated that the two latter would produce some 30,000 barrels daily and would cost more than $330 million. To interest private capital it is generally considered necessary that the government guarantee loans and promise to purchase a portion of the production.

Secretary Chapman has power to recommend government guarantees for private loans, but the guarantees must be made by the Reconstruction Finance Corporation which is now in a somewhat uncertain state. The General Services Administration has final authority on guarantees to purchase production, but relies upon the advice of agencies such as Interior and its Petroleum Administration for Defense.

It is claimed in official circles that the cost of producing petroleum by synthesis has been coming down as a result of government experimental work over the past few years, and that it is all but economically feasible. While some oil and coal companies have done some experimenting on their own account they have shown little enthusiasm generally to enter into synthetic operations on a big scale.

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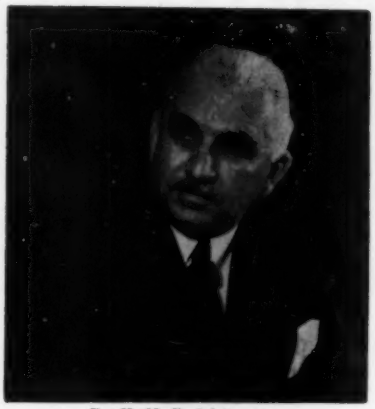
International news and notes



Dr. H. M. E. Schürmann

Dr. H. M. E. Schurmann Retires

Dr. H. M. E. Schürmann, chief geologist of the Royal Dutch/Shell Group, retired on Dec. 31, 1950. Dr. Schürmann, who was in charge of the geological department of the Bataafsche Petroleum Maatschappij, the Group's operating company responsible for exploration, production and refining, is a well-known personality far beyond the sphere of his own company and a man of great authority in geological circles.

Dr. Schürmann joined Shell in 1913 and was sent to Egypt. Later he was transferred to Indonesia where he filled various functions until the early part of 1930, when he was put in charge of the geological department at the Hague head office.

For the efficient functioning of a large organization men are required of whom one can feel sure that they will do good work far away from their bases and it was part of Dr. Schürmann's task to find these men, to train them and distribute them over the whole world, and to see to it that new blood was always available. He established contacts with the universities—mainly in the Netherlands, Switzerland and the United Kingdom—with a view to interesting promising students in the petroleum industry.

Unwittingly Dr. Schürmann characterized himself perfectly by the words which he addressed to his numerous friends at his farewell reception: "Select your men carefully, show confidence in them and leave the job to them. Let them feel that they are of some importance, otherwise they cannot take any pleasure in their work. And last, but not least, now that the war is five years behind us, all our energy should have returned, so this is no time for despondency."

E. A. Evans Retires

Elliott A. Evans has retired as chief chemist of the Wakefield group of companies after more than 35 years with the group. He is well known for his pioneer work in the use of metallic soaps in hydrocarbon oils. His first patent in this connection was taken out in 1926 and that for blends of tin and chromium soaps in 1935. Mr. Evans joined the Institute of Petroleum in 1916, became a member of the Council in 1933 and was elected a fellow in 1939. He has taken an important part in the work of the Standardization committee. In 1948, he was elected president of the Institute. He is also a member of the Oil Consumers' Council and chairman of the Classification of Mineral Oils Panel of the British Standards Institution. A member of the Institute of Mechanical Engineers, Mr. Evans is the present chairman of its Automotive Division.

Consequent upon Mr. Evans' retirement, the following appointments within the Wakefield group of companies are announced: G. H. Thornley, technical manager; P. W. L. Gossling, laboratory manager; J. S. Elliott, research chemist; and N. E. F. Hitchcock, development chemist.

Long Skid

One of the longest rig skids in Eastern Venezuela—26 miles was recently accomplished by Mene Grande Oil Co. when a rig in the West Nipa field was moved to the location of Boca-1, a wildcat northeast of the Chimire field. The job of moving 340 tons of material was performed by 43 men and 21 transportation units, in a total elapsed time of two days or 270 equipment hours, at a cost (for equipment rental and labor) of $4000. In moving the derrick, four different telegraph lines were cut and replaced, and three flowlines were buried.

Institute of Petroleum's Dinner

The mid-century dinner of the Institute of Petroleum was held at Grosvenor House, London, on March 6 with an attendance of over 700 members and guests. The honor guest of the evening was Vice Admiral Earl Mountbatten, who proposed the toast to the petroleum industry to which Deputy Chairman B. R. Jackson of Anglo-Iranian Oil Co. Ltd. made the response. Other speakers were C. A. P. Southwell, president of the Institute, Hon. Frank Hopwood, a managing director of the Royal Dutch-Shell Group, and Hon. Julius C. Holmes, minister plenipotentiary of the United States to Great Britain.

Left to right: Sir Frederick Godber, chairman, Shell Petroleum Co.; Air Chief Marshal, Sir William F. Dickson; Basil R. Jackson, deputy chairman, Anglo-Iranian Oil Co. Ltd.; Vice Admiral Earl Mountbatten of Burma; C. A. P. Southwell, president, Institute of Petroleum.

Heads Shell Purchasing

J. M. Courtright has been appointed manager of the purchasing-stores department of Shell Oil Co. of Canada, Ltd. He has been sales manager of the Shell's British Columbia operations for the past two and a half years.

Mr. Courtright is a one-time Olympic track star. He was a member of the Canadian Olympic team which went to Berlin in 1936. Two years later he competed at the British Empire Games in Australia winning the javelin throw championship for Canada.

George Noble

Noble Appointed Fawley Manager

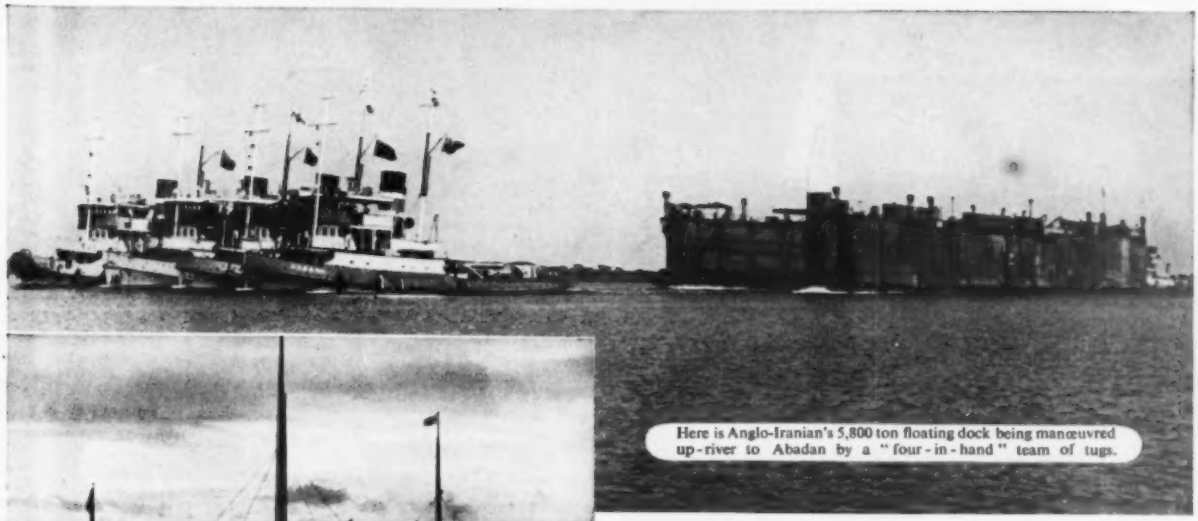
George Noble has been appointed refinery manager in charge of all refining and manufacturing activities at the Esso refinery, Fawley, England, according to an announcement by Anglo-American Oil Co. Ltd.

Mr. Noble has held positions of responsibiilty in the petroleum industry for the past twenty-one years and was formerly assistant process manager and assistant maintenance superintendent at the Sarnia refinery of the Imperial Oil Co. of Canada. At the Fawley refinery he has advanced from the position of superintendent of technical services to assistant refinery superintendent and refinery general superintendent. He is an enginering graduate of Birmingham University.

Frank Mayo, Ph.D. has been appointed assistant refinery manager in charge of refinery operations including process, mechanical and technical activities. Dr. Mayo has been concerned with refinery activities for the past sixteen years and in the Fawley refinery has advanced from plant chemist through responsible positions, including those of superintendent of technical services and process superintendent. He graduated from Birmingham University with honors in chemical engineering and during the war was engaged in research with the petroleum warfare department.

C. R. Young becomes assistant refinery manager at Fawley in charge of administration and staff departments, including employee relations, accounting, public relations and medical. He has spent twenty-nine years in the petroleum industry, having had experience in Persia and Roumania before transferring to the Anglo-American Oil Co. in 1941. He was with the petroleum warfare department and the Petroleum Board before coming to Fawley in 1946 as process superintendent. He was promoted to assistant general refinery superintendent in 1948. He is a graduate in chemistry from London University.

Ships of the Line



Here is Anglo-Iranian's 5,800 ton floating dock being manœuvred up-river to Abadan by a "four-in-hand" team of tugs.

Launches for refuelling flying boats.

Fire Drill on board one of Anglo-Iranian's fire floats.

A vast variety of vessels is afloat in the service of Anglo-Iranian, besides the huge tanker fleet to which the ship on the left now belongs. This is the "British Adventure," launched in December, 1950 — of 28,100 tons — the largest tanker so far built in Britain. Even bigger vessels are now on order for Anglo-Iranian's fleet.

First and Biggest

oil producers in the Middle East since 1912, Anglo-Iranian Oil Company and its associated companies also operate twelve refineries in Europe, Middle East and Australia; their sales organisation includes major marketing or supply interests in Europe, Asia, Africa and Australasia, with international ships' bunkering and aviation services.

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Oil company staff changes

W. T. Kennedy E. Paul Ward

E. PAUL WARD, Houston division petroleum engineer of The Ohio Oil Co., has been appointed assistant to the manager of production at Findlay, Ohio. R. E. McMillen, Tulsa division petroleum engineer, succeeds Mr. Ward at Houston and F. V. Kluck has been appointed Tulsa division petroleum engineer. W. T. Kennedy, district superintendent, Haynesville, Louisiana, has been appointed assistant to the general superintendent of production, Findlay.

K. A. ACKLEY has been appointed assistant to the production department manager for The Carter Oil Co., Tulsa. O. D. Harper, Mattoon, Ill., has been made superintendent of the eastern division to succeed Mr. Ackley. Ray Hart, Tulsa, becomes division exploration manager and Wade Turnbull, Grand Rapids, Mich., has been named eastern division geologist.

HERBERT F. MILLER has retired as vice president and director of The Carter Oil Co. after 48 years of service which carried him to oil areas in many parts of the world. Mr. Miller has headed Carter's crude oil purchasing department since its formation in 1933. He began his petroleum career in 1902 as an office boy in New York with the marine department of Standard Oil Co. (NJ). In 1909 he became secretary to Walter C. Teagle, former Jersey Standard president, with whom he traveled extensively in Europe. He also spent three years in Canada with Imperial Oil Ltd., another Jersey Standard affiliate before joining Carter in 1921.

Herbert F. Miller

CASTLE J. HARVEY has been appointed manager of Deep Rock Oil Corporation's geophysical department. He has been engaged in geological and geophysical work in the southwest for nearly 20 years. His connections have been with Geophysical Research Corp., Amerada Petroleum Corp. and Atlantic Refining Co.

F. M. FILES has been appointed superintendent of the northwest division of Phillips Petroleum Company's refining department. He replaces J. W. Loy, who is on leave with the Petroleum Administration for Defense in Washington, D. C.

FRANK LINDEMAN, JR., formerly operating superintendent, has been named general superintendent of the producing department of Stanolind Oil & Gas Co. H. T. Hunter succeeds him as operating superintendent in charge of production and drilling. Mr. Hunter has been assistant division production superintendent in the Central Division.

Mr. Lindeman joined Stanolind in 1933. He was granted a military leave of absence to serve in the Army Corps of Engineers in 1942. Following his discharge four years later with the rank of Lieutenant Colonel, Lindeman returned to Stanolind. He was in charge of Stanolind's marine operations in the Gulf of Mexico prior to becoming operating superintendent in 1949.

Mr. Hunter also served four years in the armed forces being discharged with the rank of Major in the Field Artillery. Following his return to Stanolind, he advanced to the post of assistant division production superintendent in 1948.

H. W. MANLEY has been elected a vice president of Sunray Oil Corp. in charge of natural gasoline manufacturing operations. He came to the company last June when properties of Barnsdall Oil Co. were merged with Sunray. He had been with Barnsdall since 1929 advancing from roustabout to vice president.

Other Barnsdall men who were named vice president at the same time were R. E. Foss, Los Angeles, general superintendent of the California division and M. Darwin Kirk, general attorney. Mr. Foss joined Barnsdall in 1935 and was made a vice president ten years later. Mr. Kirk had been a member of the Barnsdall legal department and a vice president.

F. E. RICE, vice president of natural gasoline and gas department, director, and a member of the executive committee of Phillips Petroleum Co., retired February 28 after almost 33 years of service. Shortly after joining Phillips, he designed a plant at Pershing, Okla., which successfully established the modern oil absorption process for extracting natural gasoline from natural gas. It is upon this principle that the industry operates almost exclusively today.

Mr. Rice was one of the first to receive a "Certificate of Appreciation" from the American Petroleum Institute in November 1948. In April 1949, he was presented the Hanlon Award by the Natural Gasoline Association of America, the highest honor in that industry.

T. J. GATES has been advanced to the post of refinery engineer at the Torrance, Calif., refinery of the General Petroleum Corp. Mr. Gates has been a maintenance control engineer. He served for four years during World War II in the Chemical Warfare Service, holding the rank of Captain upon discharge.

FREDERICK B. HUFNAGEL, JR. has been appointed assistant to R. H. Anders, director of purchase of Sun Oil Co. He has been relieved of his duties as assistant coordinator in the marketing department for the duration of the current emergency. He will represent Sun with government agencies in the administration of regulations controlling materials and their supply.

E. W. Webb A. W. Tarkington

E. W. WEBB, manager of Continental Oil Company's production department and A. W. Tarkington, assistant to the president, have been elected vice presidents. Mr. Tarkington is to become regional general manager of the company's central region, with headquarters in Oklahoma City. Mr. Webb will continue his active management of production.

Mr. Webb has risen through the ranks in the production department, having joined Continental as a petroleum engineer at Seal Beach, Cal., more than 24 years ago. He was appointed assistant manager of the production department in June, 1947, and became manager in January 1949. Joining Continental as one of the youngest top-flight officials of a major oil company in the United States, Mr. Tarkington was elected treasurer in August, 1948. He was named assistant to the president in February, 1950.

H. D. MOORE has been appointed western manager of wholesale sales for Sinclair Refining Co. His territory comprises sixteen states west of the Mississippi. At the same time the appointment of O. M. Ogden, as manager of whole sales for the eastern and southeastern sales regions was announced.

WALLACE E. AVERY has been appointed assistant general manager of industrial and public relations of The Texas Co. with headquarters in New York. His new assignment will be principally in the field of industrial relations. Mr. Avery joined The Texas Co. in May, 1945, as an attorney at Los Angeles to handle labor matters.

Wallace E. Avery

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Financing Canada's Oil Industry

By Gordon M. Grant

CANADA stands almost without a parallel among nations of the world for its sustained high volume of capital expenditures in relation to national income. The equivalent of one out of every five dollars of national income, until recently at least, has been channelled into equipping industry.

The greatest single contribution to this remarkable rate of expansion has been made by the oil industry, particularly the producing, refining and marketing divisions located in Western Canada. It is estimated that in 1950, oil expenditures were roughly ten percent of an estimated $3.5 billions of private investment. This placed oil ahead of iron ore, newsprint, base metals and other avenues of endeavor where productive facilities were being enlarged.

A galaxy of oil fields around Edmonton, Alberta, all discovered since February, 1947, has served to provide the push behind major expansion of a broad range of industry in Western Canada. Emergence of large reserves of cheap natural gas has been an important subsidiary factor.

Hundreds of new industries have been established in Edmonton and Calgary as the direct and indirect result of expanded oil resources. With an abundance of coal, large forested areas, limestone, salt and clay, Alberta has been deemed a "natural" for industrial development. Now the vast expenditures of the petroleum industry have spurred plans in many directions. Some of the plans are rather ambitious. An estimated $40 million, for example, is to be spent by Celanese Corp. of America to establish a petrochemical industry at Edmonton, and products will include acetic acid, formaldehyde (not at present produced in Canada), methanol, propylene glycol and other alcohols and solvents. Acetic acid will be combined with wood pulp from the associated Columbia cellulose plant at Prince Rupert, B. C., to turn out cellulose acetate, the primary raw material for acetate yarns and plastics. The new plant is expected to materially assist defense programs in both the United States and Canada and is expected to be a landmark in the growing industrialization of the Canadian west.

Statistics show what new petroleum riches have meant to the prairie provinces. The population of Edmonton, historic gateway to the north country, has risen from 119,000 to 145,000 since 1947. Bank clearings of checks against individual accounts amounted to $213.6 millions (Canadian funds) in November, 1950, an increase of 111.3 percent over the monthly average of 1946, the year before Leduc was discovered. Calgary still leads as a business center at a slightly slower pace. Its clearings were $276.8 millions in November, 1950, an increase over 1946 average of 86.7 percent. Despite great building booms in both centers, office space continues critically short. Behind the broad expansion of economic activity are hundreds of millions of oil industry dollars provided chiefly by about 200 American, Canadian and European oil companies.

This year is expected to see $200 million spent on oil exploration and oil field development against $150 million in 1950 and just over $100 million in 1949. In pre-Leduc days, expenditures were at the rate of $12 million a year.

Facilities for marketing and refining crude oil have required comparable expenditures for oil field exploration and development.

Prior to discovery of Leduc, prairie oil refining capacity was 40,000 barrels. Prairie refining capacity has since been approximately doubled at a cost of close to $40 million. Capacity is expected to reach 100,000 barrels daily in 1952. Edmonton, which had no refining capacity at the beginning of 1947, is processing over 20,000 barrels of crude daily. This will be raised to 31,000 barrels daily shortly with three refineries in operation.

Outlays for pipe lines and related facilities have been well over $100 million in the past two years. The Interprovincial line from Edmonton to the head of the lakes, completed late last year, cost $90 million. A spur line to Winnipeg cost another $10 million.

Other pipe line projects, of course, are in the offing. Authorities have not given the "green light" on export of gas from Alberta or for a second pipe line for crude, but hundreds of millions will likely be "put on the line" for further facilities over the next few years. Steel is reported ready right now for an oil line to the Pacific coast. Recent research has indicated that it would be even feasible to pipe Alberta oil as far east as Montreal.

Besides direct capital expenditures of the oil industry, the Canadian oil situation has been influenced by two other related oil factors: elimination of the drain on prairie finances represented by money formerly required to import oil and oil products; sharp reductions in prices of gasoline, fuel oil, and other petroleum products to the consumer as local refining activity has risen.

These factors are important. The first means that over $100 million (U. S. funds) is now being saved each year by Canada because of new found sources of Alberta-Saskatchewan crude. This saving, plus the large United States investment in Canada, has made for a relatively strong Canadian dollar. The saving to prairie consumers arising out of lower product prices amounted to $30 million in 1950 with a larger saving anticipated in the current year.

Lower fuel prices have lowered costs of mechanized mining which is big business in the Canadian west. The laid down cost of a $2.50 Mid-Continent crude at the Regina, Saskatchewan, refinery, used to be $5.00 a barrel. Today Alberta crude can be laid down at just over $3.00 a barrel.

Besides the lowering on wholesale petroleum product prices which has already been instituted, further reductions are almost certain this spring when the well-head price of crude in Alberta is reduced, reflecting competition of Alberta crude with Mid-Continent crude at Sarnia, Ontario.

Barring any intermediate change in the price of Mid-Continent crude, the price of gasoline (at wholesale) in Winnipeg will be five cents a gallon lower than before the Interprovincial Pipe Line from Edmonton came into existence. Refining capacity at Winnipeg and the pipe line are playing a dual role in making this significant reduction possible.

The government of Alberta, as well as the general public, has been a major beneficiary of new oil discoveries. Because 93 percent of the mineral rights belong to the province, the provincial treasury receives most of the royalties from production. From government acreage, the province currently receives a royalty of 12½ percent or one barrel in every eight produced. Alternatively, however, an operator can elect to pay a royalty equal to the square root of his production.

With over a billion barrels of oil proven in the province, Alberta appears likely to enjoy royalty revenue of $250 million over an extended period, assuming an oil price of only $2.00 a barrel. Prospects of a major extension of known reserves are bright.

But royalties have not been the most important immediate source of income from oil for the provincial government. Sale of leases (the 50 percent of acreage which an exploring company returns to the government on making a discovery) has been a prolific source of revenue. Over $50 million of oil industry money poured into Alberta government coffers in 1950. Of this, over $35 million represented Crown reserve lease bonuses; the balance was lease and reservation fees and production royalties.

Most of the lush acreage in the Redwater field has now been sold but further acreage is expected to come in on the auction block as the result of newer discoveries.

Many sources have shared in providing the hundreds of millions of new capital expended by the Canadian oil industry in the past few years. Major (and minor) oil companies, insurance companies, Canadian and American banks, more conservative Canadian investment firms, have all played a prominent part. A minor part of the money has been raised by the flamboyant type of promoter and it is all too true that the limited funds reaching the company treasury from this type of operation have not always been wisely spent.

Oil company earnings, depreciation and depletion funds, accumulated working capital, have been tapped to provide for growth requirements of a great new industry. But these in themselves have fallen far short of providing the $400 million estimated to have been provided for expenditure of about 200 leading companies.

(Please turn to page 82)

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The history of Canadian oil finance provides some interesting sidelights on the way the business is being financed today.

In the days before crude was discovered on the west flank of Turner Valley in 1936, the experience of the average Canadian investor with the average Canadian western oil company had been far from satisfactory. Where some success had been met with in raising funds and subsequent development, all too often the fruits were dissipated in abortive wildcatting. Few companies had the funds to carry through any concerted program to completion in the costly foothills belt. When crude was finally discovered in Turner Valley, financing by sale of royalty units (over and above landowner's royalty) caught the public's fancy. Here was a way to invest for a tax-free income without returns getting used up in wildcatting! Promoters took as their profit, net deferred royalties which didn't share in distributions until cost of the well had been returned to parties putting up the drilling funds. But income tax authorities at Ottawa early in World War II decided that royalty distributions should be taxed and royalty financing "folded." A considerable number of more stable oil companies such as Home Oil, Anglo-Canadian, Royalite and others did fairly well in Turner Valley and provided a solid nucleus for expansion of Canadian participation in the western oil boom when Imperial Oil clicked at Leduc.

As discoverer of Leduc in 1947 and Redwater in 1948, and largest holder of productive acreage in both these areas, Imperial Oil found itself with major capital requirements for oil field development, refining facilities and, later, for pipe line facilities.

Arrangements were made for sale of Imperial's two chief subsidiaries (International Petroleum and Royalite Oil Co.) to provide funds for developing western acreage. Interest in International Petroleum Co., sold to shareholders in June, 1948, brought $39,390,004 cash, $41,909,344 of interest-bearing notes. A further $14,783,526 was realized from sale of the controlling interest in Royalite to Dominion Securities Corp. Three smaller subsidiaries were also sold. Then $20 million was raised in the refunding of a bond issue in 1949. But oil revenues pouring in permitted working capital to be more than doubled to $147.6 million in the two years up to the beginning of 1950.

American companies, carrying out widespread exploration in Saskatchewan as well as Alberta, brought an immense amount of United States capital into the country. The exact dollar volume is not known because of certain undetermined factors such as remuneration of employees. In the early stages, most of the all-Canadian companies were able to finance operations from their own resources, or were too small to compete effectively in the new big-time oil business.

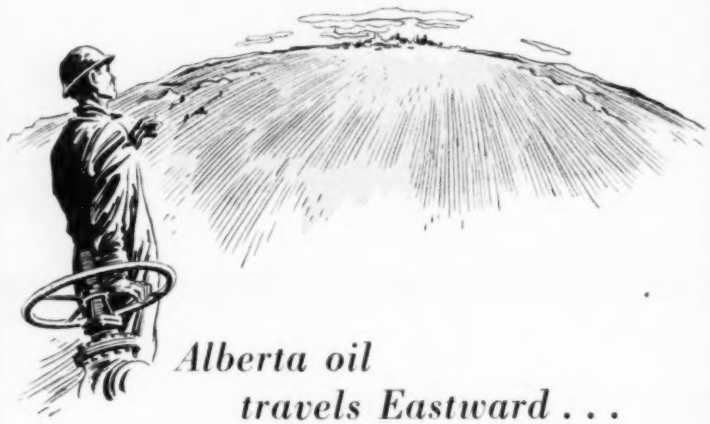
When Interprovincial Pipe Line Co. arranged $90 million of bond and debenture financing for its 1,150-mile pipe line, the event had a profound influence on the course of further Canadian oil finance. Of the $90 million of financing, $17 million was in the form of four percent debentures which were convertible into common shares on the basis of two common for each $100 par values of debentures. To the amazement of Canadians, if not of their neighbors, these debentures which had been sold at par, rose spectacularly to $3,050 for a thousand dollar unit.

This served to popularize convertible debenture issues and other similar issues were soon made. Anglo-Canadian Oil Co. brought out a $4-million convertible issue late in 1949. Calvan, Garrison and Charter, which had been participating with Pacific Pete, and Atlantic Oils in development of Redwater acreage, were among others issuing convertible debentures. Central Leduc issued $2 million and Trans Empire Oils, an amalgamation of C. C. Cross group companies, is the latest to tap the convertible debenture route to new funds.

But one important borrower, Royalite Oil Co., has demonstrated that it is possible to borrow money quite cheaply on the strength of oil resources without necessarily having recourse to a convertible feature. Royalite in mid-1950 placed an $8-million issue with an institution investor. The purchaser was not revealed at the time but is understood to have been the Sun Life.

Large-scale public participation in million dollar purchases of acreage in Redwater were arranged by well-established Canadian financial houses through the medium of a speculative type of debenture bonussed with common stock. Acreage in Redwater almost invariably worked out as anticipated and many

(Please turn to page 84)



Alberta oil travels Eastward . . .

The opening of the navigation season this Spring on the Great Lakes will mark another major event in Canada's important oil history. For at that time Alberta crude oil, which arrived in Superior, Wis., before the end of 1950 after travelling 1,200 miles from Edmonton by pipeline, will be transported by lake tanker to refineries at Sarnia.

These events will thus have a tremendous effect on the economic position of our country. This prospect and its development should be of great interest to investors and financial institutions.

Inquiries regarding bonds or shares of Canada's leading oil producers, refiners and related companies will be promptly answered.

DOMINION SECURITIES GRPN. LIMITED

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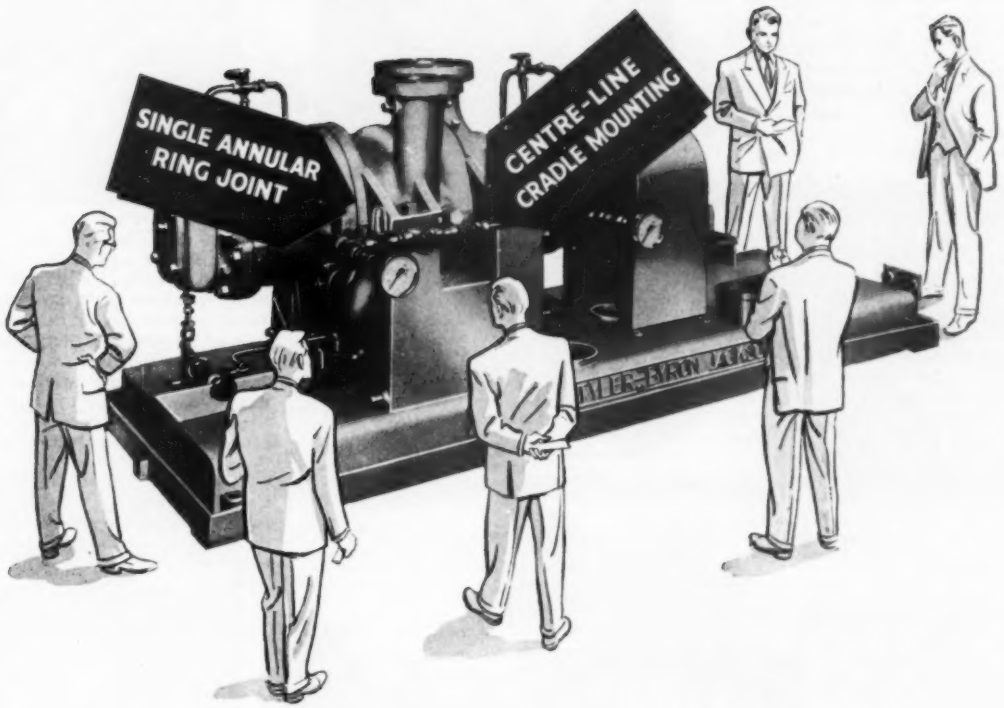
These are sound engineering reasons



The special keynote of this Hayward Tyler-Byron Jackson "VC" pump is efficiency. A special purpose 2-stage centrifugal, it is designed specifically for Refinery service where high temperatures and high pressures are involved.

The vertically split case and cover with its fully trapped circular metallic enclosed gasket is certain to ensure a tight joint under high temperature and pressure. This joint is far more easy to make and maintain than the irregularly shaped flat gaskets used for horizontal split case joints. The entire rotating element may be removed for inspection without disturbing either suction or discharge piping.

Centre line cradle mounting permits thermal expansion in all directions under high temperature without misalignment.

General Specification: Capacities 200-5,000 Imp. gallons per minute. Heads up to 1,400 feet at speeds up to 3,600 r.p.m. Temperatures up to 900°F. Pressures to 1,000 p.s.i.g.

HAYWARD TYLER

BYRON JACKSON

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purchasers of debenture-stock units estimated that oil in the ground had been acquired at a price of about 50 cents a barrel. But because of low allowables for Redwater wells, in relation to reserves present, 50 to 75 years might be required to recover all indicated recoverable oil at some wells. Dome Mines, which formed Dome Exploration (Western) was one of the successful developers at Redwater.

Although the federal government has made a change in its law and tax-free royalty financing appears to be a possibility, this type of financing has not reappeared on any scale since the last hectic days of active Turner Valley development.

With most of the lush Crown acreage at Redwater now sold, the oil industry is waiting to see what other acreage the Alberta government may have to offer. United States companies were early, and successful, participants, in the spirited bidding for Redwater oil rights. As prices rose steeply, however, a tendency was noted for United States companies to leave this field to Canadians.

The outlook for the western Canadian oil industry is one of expanding capital requirements. If oil and gas reserves grow in the fashion which many industry authorities expect, a billion dollars of new capital may be required over the course of the next few years.

RAWLEIGH WARNER, JR., secretary of Continental Oil Co., has been promoted to assistant to the president. He will transfer from New York to Houston. Pete Dominic, assistant director of sales administration, Ponca City, Okla., succeeds Mr. Warner as secretary.

©Fabian Bachrach

Alexander Fraser

ALEXANDER FRASER, chairman of the executive committee and a director of Shell Oil Co., retired March 31. He has been with Shell 32 years and was president from 1933 until 1949.

A native of Glasgow, Scotland, Mr. Fraser took his first job with the Pumpherston Oil Co., one of the pioneers in Scotland's shale oil enterprises. In 1910 a new association with the General Asphalt interests took him to the Trinidad oil fields. A few years later, he was transferred to General Asphalt's head office in Philadelphia, with responsibility for supervising the company's interests in both Trinidad and Venezuela. During World War I he served as Secretary of the Inter-Allied Petroleum Council, with headquarters in London.

The war over Mr. Fraser returned to the United States where he joined the Shell organization in 1919. He became president of the Shell Petroleum Corp. in 1933, and in 1939 when the various Shell companies were consolidated, he was made president of Shell Oil Co., Inc. He became president of Shell Union Oil Corp. in 1947 and in September, 1949, when Shell Union absorbed Shell Oil and took the name of Shell Oil Co., Mr. Fraser became chairman of the executive committee of the new company.

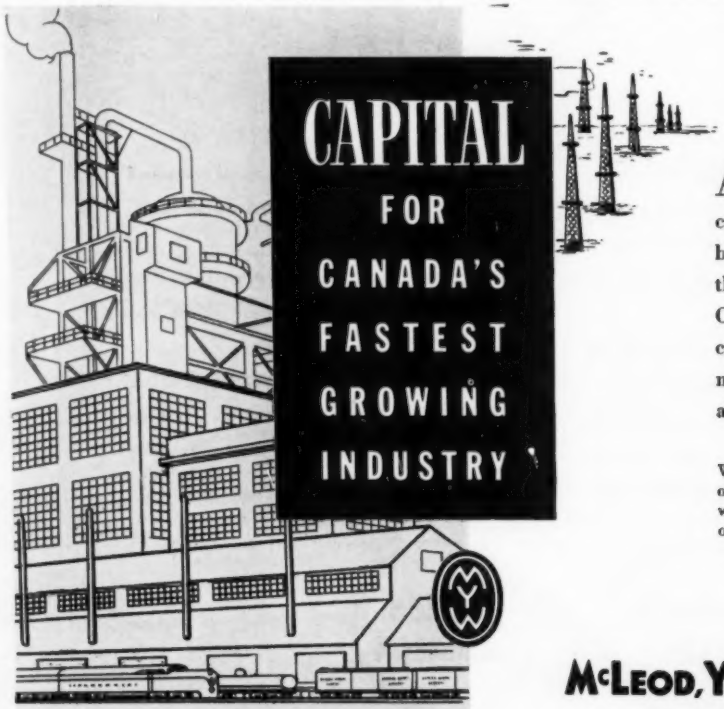
J. N. S. LONGE, assistant manager for Shell companies in Venezuela, has retired after 30 years of continuous overseas service for the company. He saw service in Mexico and Trinidad for many years before going to Venezuela to supervise industrial relations. He was appointed assistant manager in 1946.

Canadian Oil's New Refinery

(Continued from page 66)

products at the refinery site have a capacity of 2,000,000 barrels. The plant is expected to go on production about May 1952.

Canadian Oil manufactures and sells more than 600 petroleum products, all of which are marketed under the trade name of "White Rose." Canadian-owned since 1938, the affairs of the company and its subsidiaries, Canadian Oil Refineries Ltd. and White Rose, Ltd. are administered by an all-Canadian directorate, with P. A. Thomas of Montreal as chairman and W. Harold Rea, of Toronto, as president. The other directors are Gordon F. Perry, vice president; and Aubrey Davis, John W. McKee, A. J. Nesbitt, D. P. Robinson, E. G. Smith and W. Dent Smith. Ninety-seven percent of the shareholders are Canadians, and they own 99.43 percent of the stock. The head office is in Toronto.



As underwriters and distributors of corporation securities, we have been identified for many years with the raising of capital funds for leading Canadian firms in industry and commerce, including major companies in the oil and allied industries.

We invite inquiries from concerns interested in the oil and gas developments in Western Canada and who are seeking additional capital funds to establish or expand operations.

McLEOD, YOUNG, WEIR & COMPANY
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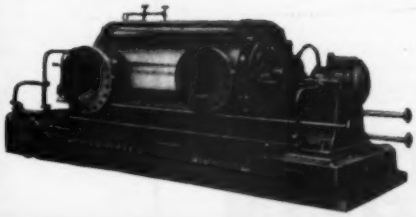
Centrifugal Pumps & FLAMEPROOF MOTORS

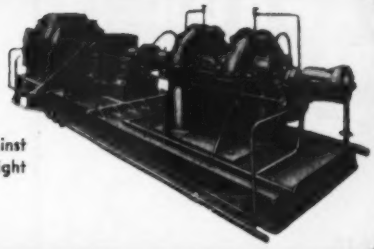
Main Pipeline Pumps....



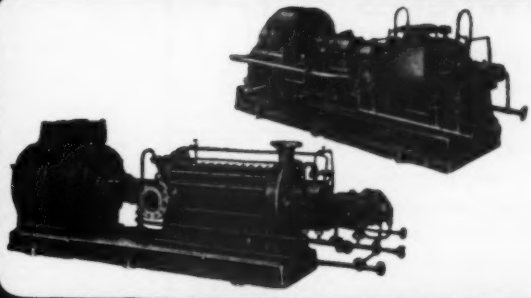
Mather & Platt multi-stage 'Plurovane' pumps were amongst the earliest centrifugal pumps installed for main line work. The pump shown on the left is a typical modern 'Plurovane' designed for a throughput of 50,000 bbls/day of crude oil against a pressure of 750 p.s.i. when running at 1500 r.p.m.

Transfer and Loading Pumps

Our standard ranges include a pump for nearly every transfer or loading duty. The two-stage "Medivane" pump illustrated on the right can handle 700 tons/hr. of crude or products against heads up to 500 ft. It is driven through a gas tight wallbox by a 550 h.p. Mather & Platt Motor.



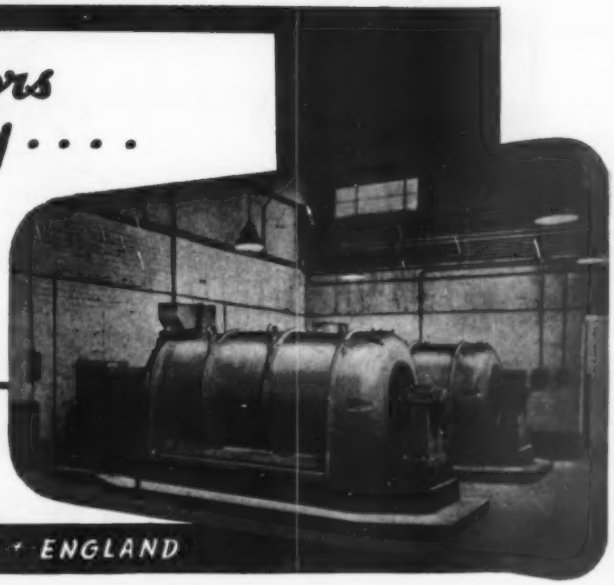
Refinery Process Pumps



Our long refinery experience at home and abroad enables us to supply pumps for the most arduous refinery duties. The illustration shows typical units:—a steam turbine driven pump handling oil at 500 degs. F. and a motor driven "Plurovane" pump dealing with light volatile hydrocarbons.

Flameproof Motors on Pipeline Duty....

Mather & Platt electrically-driven centrifugal pumps on an oil pipe line. The motors here illustrated are of the totally enclosed flameproof type, and are of 1,000 h.p. capacity, fed from a 3 phase 50 cycle 6000/6600 volt supply. They are squirrel cage direct-on started machines with a starting current of four times full load value.



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OIL IN WESTERN CANADA
THE PIPELINE TO PROGRESS
THE DOMINION BANK through its branches in Western Canada is well informed on oil and other developments and invites your enquiries. Write to any of our branch managers in Western Canada or the Supervisor, Foreign Department, Head Office or our Agent at New York.
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"AIDING IN THE DEVELOPMENT OF CANADA SINCE 1871"

International Significance of Canadian Oil

(Continued from page 40)

Supply houses, warehouse facilities and machine shops have been established; these together with local industries are capable of providing equipment and the necessary supplies to maintain some 130 rigs and over 100 seismic, gravity and magnetometer parties in the field.

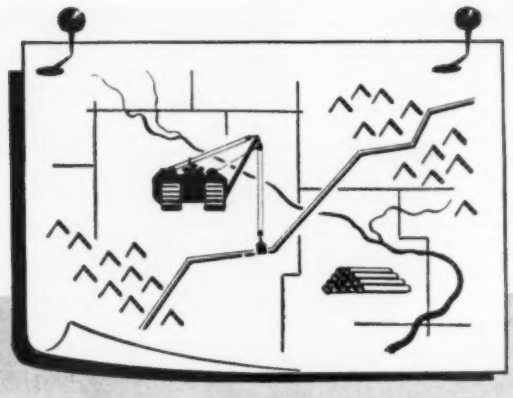
Rapid strides have been made in overcoming the handicaps of cold weather in exploration, drilling and production operations. Production and drilling equipment have been winterized, enabling the present large scale operations to be carried on all the year around. Drilling rigs are completely housed during the cold weather and heated with steam boilers. In regard to production most fields overcome the majority of their difficulties with steam installations at well and battery sites. In one major field, however, Redwater, production operations are carried on in extremely cold weather without the use of auxiliary heating equipment. To date this has proved successful although there are still a few minor problems to be solved but operating costs have been cut substantially. In the northern part of the Province where there are large muskeg areas, exploration and drilling can only be carried on in the winter months. Invaluable experience has been gained in this type of operation.

Altogether the industry is well equipped to carry on exploration and development even on a more extensive scale than in 1950 when all records for footage drilled, well completions and production were broken.

Refining capacity has been increased to keep pace with the rapidly growing demand in Canada. New and up to date refineries are being built across the country. Canadian per capita consumption of petroleum products is second only to that of the United States and in recent years the demand has shown an ever greater percentage increase than in the United States.

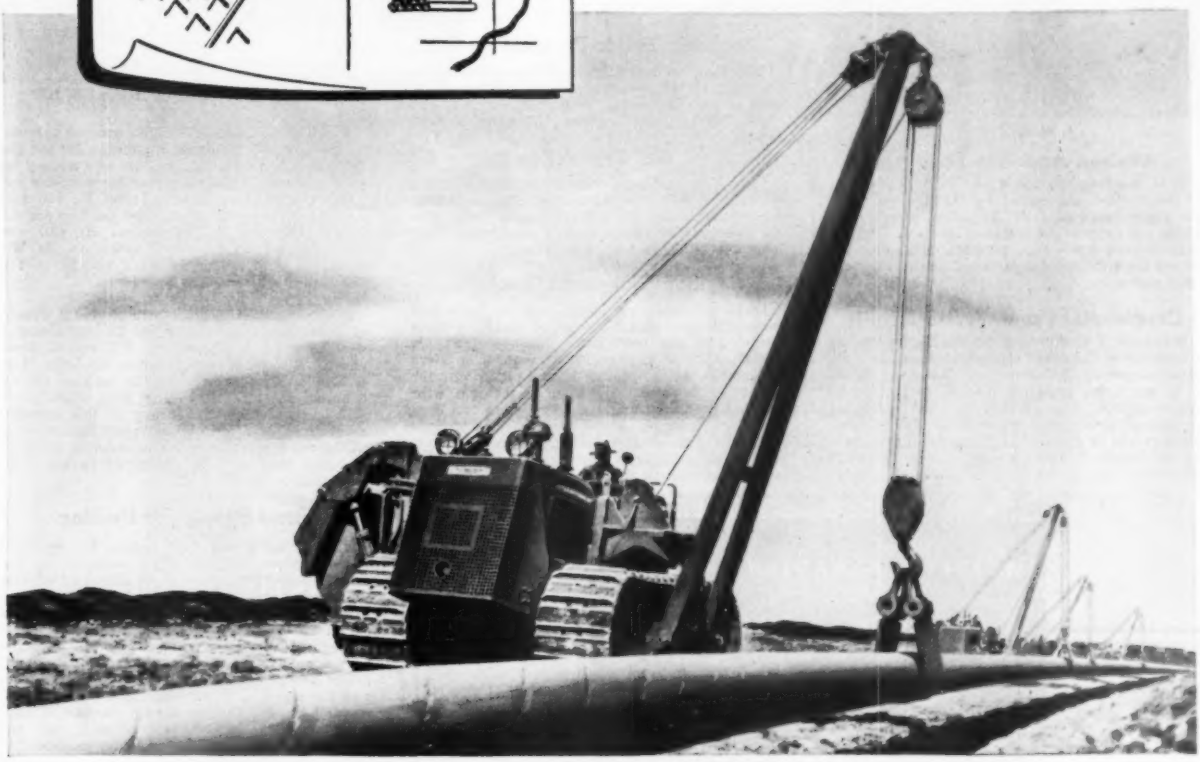
The establishment of a large petrochemical plant in Edmonton was announced recently by the Celanese Corporation of America. This is the forerunner of other plants which will be established to utilize liquid petroleum gases produced from gas conservation plants and refineries together with natural gas for the manufacture of important chemicals.

To sum up, the prospects of finding additional reserves of oil in Western Canada are excellent. The industry is well prepared to undertake further large scale exploration and development operations which should result in Canada being able to produce at least its own requirements and thus assist in making the North American continent self-sufficient in the event of an emergency which might jeopardize our chances of obtaining oil from other sources. The problem of distributing Canadian and United States production to make available crude oil and petroleum products where and when they can be utilized to the greatest advantage is one which should engage the immediate attention of both governments with a view to establishing a long range policy.



Putting ideas into action

Pipelaying results are better than ever with an International TD-24 Diesel Tractor and the new Superior-Cardwell Pipeboom. Why? Because you work with the unmatched maneuverability of the world's most powerful tractor . . . capitalize on this performance through flexibility and positive control of a pipeboom with 90,000 pounds lifting capacity.



World's most powerful pipelaying team . . .

International TD-24 Diesel plus Superior-Cardwell PBI-24C Pipeboom! No other equipment can match the outstanding performance record of this combination.

The TD-24 with 148 drawbar horsepower has the ability to handle any crawler assignment. And the new Superior-Cardwell Pipeboom turns that ability into absolute top pipelaying performance. You can lay in 34-inch pipe with ease . . . lift 90,000 pounds at a 4-foot overhang, lift 25,000 pounds and stay 14 feet back from the trench. Extendable counterweights, hydraulically-controlled from the tractor seat, make this tremendous capacity possible without extending tractor treads.

Yes, this equipment cradles the biggest pipe with amazing flexibility of operation, puts the entire pipelaying operation on a faster, more economical basis. See your International Industrial Power Distributor for all the facts. International Harvester Export Company, 180 N. Michigan Avenue, Chicago 1, U.S.A.

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WHEEL TRACTORS
POWER UNITS

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J. M. McFadden

Axelson Appoints Treasurer

J. C. Axelson, president and general manager of the Axelson Manufacturing Co. has announced the appointment of J. M. McFadden as treasurer of the company to succeed the late O. W. Carlson. First joining Axelson in 1938 Mr. McFadden has served the accounting department and as assistant office manager.

Continental Proposes Stock Split

Directors of Continental Oil Co. have proposed a doubling of the share capitalization of the company, increasing the authorized number of shares of $5 par value from the present six million to twelve million. If approved by stockholders at the annual meeting on May 8 a 100-percent stock dividend will be distributed. At its February meeting the board declared a cash dividend of $1.20 per share to stockholders of record March 2, 1951.

Chemistry of Acrylonitrile

Industrial chemicals division of American Cyanamid Co. has published a 96-page technical book entitled the "Chemistry of Acrylonitrile." It is the first major piece published on acrylonitrile and its applications. The new book discusses the synthesis, physical properties and chemical properties of acrylonitrile. It also summarizes the present and potential applications of the compound including new synthetic fibers. Notable among the present applications of acrylonitrile is its use in Buna-N synthetic rubber.

Copies of the new book, or additional information, may be obtained by writing on company letterhead to the Industrial Chemicals Division, Department NR, American Cyanamid Co., 30 Rockefeller Plaza, N. Y. 20.

Authorization to Prospect for Oil

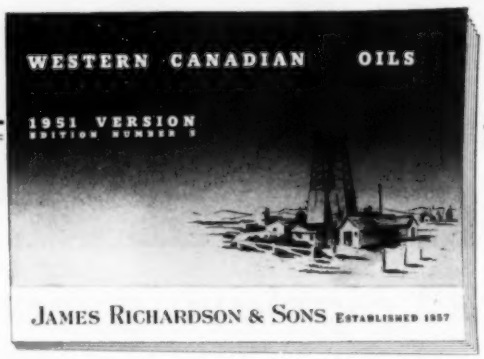
The Companhia Itatig has been authorized to prospect for petroleum and natural gases in an area of 24,000 acres in the municipalities of Joaquim Tavora and Tomazine, State of Parana, Brazil.

IPC Production

Iraq Petroleum Co. reports production from its Kirkuk field for November 1950 as 585,425 long tons or roundly 148,000 barrels daily. For the same period the Qatar field produced 150,270 long tons or 38,500 barrels per day.

Cooling Equipment Brochure

Hudson Engineering Corp., Houston, Texas, has issued two new booklets—one on Hudson cooling towers and one on Hudson induced draft air cooled units. A 22-page brochure in color gives information on the cooling towers picturing sizes and types to meet any requirement and with drawings and diagrams showing design and construction features. An 8-page booklet on air cooled units shows installations for jacket water, gas, steam and hydrocarbon vapor cooling. Copies may be obtained on request.



Of Value To Those Interested in Western Canadian Oil Companies

The 1951 Version (edition No. 5) of our booklet "Western Canadian Oils" contains the latest maps, facts and figures, relating to oil and natural gas developments in Western Canada, together with detailed information on the many Canadian and United States Companies operating in Western Canada. This 144-page booklet is of especial interest to those wishing to keep informed about each company's activities. A complimentary copy will be sent on request.

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James W. Christopher, Herbert E. Hill

JAMES W. CHRISTOPHER, account executive at West Coast advertising agencies for the past ten years and who operated his own agency last year, announced the merger of his company with Lannan & Sanders, Dallas, Texas. He will manage the Los Angeles office under the firm name of Lannan, Sanders & Christopher. He will work with Herbert E. Hill on Halliburton Oil Well Cementing Co. account. Offices will be at 1127 Wilshire Boulevard, Los Angeles.

JOHN M. SCHIFF has been elected a director of Tide Water Associated Oil Co., according to announcement by president William F. Humphrey. Mr. Schiff is a partner of Kuhn, Loeb & Co., investment bankers. In making the announcement, Mr. Humphrey said, "Mr. Schiff will bring to the directorate of this company his wide experience in business and finance which will prove invaluable in the solution of the many problems that may be submitted to the board from time to time."

Steel Supply for Drilling

Putting under way the program for supplying the oil industry with drilling material the National Production Authority on March 12 directed the production during April of 157,500 tons of tubular goods—casing, tubing and drill pipe. Allocation of steel to mills at the same rates in subsequent months would amount to 1,890,000 tons annually. This amount is calculated as sufficient for the drilling of 43,400 domestic wells and for essential export requirements. The estimates both as to the minimum number of wells necessary to maintain oil reserves and output and the amount of steel that could be provided for this use were arrived at as a result of careful surveys and of conferences between government officials and representatives of both industries.

A four-point program for the efficient use of tubular goods was recommended to oil and gas producers and state regulatory bodies by the Petroleum Administration, through Richard G. Lawton, director of production:

(1) Examination by state regulatory bodies of existing rules governing well-spacing, with a view toward revision to permit drilling new wells farther apart where practical, and producing more from each well. Such action, Deputy Administrator Brown has said, will place greater petroleum reserves and productive capacity behind a given amount of tubular goods.

(2) Increased use of pressure maintenance and repressuring operations in oil and gas reservoirs through operation of reservoirs as single units, in order to maintain maximum efficient rates of production at as high a level as possible for as long a period as possible, thus increasing ultimate recovery.

(3) Careful examination of field rules and existing practices in the use of tubular goods for drilling wells, with a view toward reducing requirements for surface and intermediate-string casing by shortening or eliminating strings of large-diameter pipe, or making use of smaller, lighter pipe.

(4) Wider use of dual completions, the practice of tapping two or more petroleum reservoirs with a single well-bore.

SET THE
STAGE
NOW
FOR 1952
WE ARE THE ORIGINATORS OF THE "NEW LOOK" IN REFINERIES, WITH "PICTURE WINDOWS" TO MAKE THE PUBLIC CONSCIOUS OF YOUR PROGRESSIVENESS.

You remember how fast 1950 passed. 1951 will seem to pass even more quickly and by 1952 you will wish your refinery were modernized or that you had an entirely new plant.

You can have that new cat cracker or new refinery if you plan now, and place your problem in our hands. We have the ability, manpower and equipment to design, engineer and construct the refining facilities you need in the least possible time.

Call, wire or write for a discussion of your refining problems and their solution, without obligation. Our airplanes make us neighbors.

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REFINERY ENGINEERING *Company*

PHONE 5-5561 • TULSA, OKLAHOMA

Haslam Elected to Worthington Board

Robert T. Haslam has been elected a director of Worthington Pump and Machinery Corp., according to an announcement today by H. C. Ramsey, president. Until recently he was a vice president and director of Standard Oil Co. (N.J.). A director and member of the executive committee of Ethyl Corp., he also is a member of the Corporation of Massachusetts Institute of Technology.

New Phillips Line

Phillips Pipe Line Co. will build a 278-mile, 10 inch crude oil trunk line, extending east from Phillips, Texas, to Yale, Okla. The 25,000 barrel line will tie the company's present West Texas line into the Oklahoma-Kansas crude systems, and will aid in supplying refineries at Okmulgee, Okla. and Kansas City, Kans.

Buys Gas Reserves

Hugoton Plains Gas and Oil Co., a new company, has purchased leases covering 95,000 acres of proven gas lands in the Oklahoma panhandle and western Kansas. Reserves are estimated at 800 billion cubic feet and current production being sold to Northern Natural Gas Co. is 90 million cubic feet daily from 154 wells. Production is to be increased to 120 million cubic feet daily by drilling 30 to 40 additional wells. A 100,000-gallon gasoline plant is being built near Hooker, Okla. Purchase price for the gas properties was about $36 million.

Officers of the new Hugoton firm are J. Simon Fluor, president; Fred R. Tuerk, chairman; Donald Royce, vice president; G. Hamilton Beasley, treasurer; and Dewey F. Gruenhagen, secretary. Mr. Fluor is well known in the petroleum industry as executive vice president of the Fluor Corp.

Your Partner in the **OILFIELDS**

Imperial Bank has pioneered banking service in those areas now making oil history. And it has a wide and long-established familiarity with local conditons.

The special knowledge of Imperial Bank's oil representative, Mr. A. S. de Rosenroll, manager of the main Branch in Calgary, is at your service. Imperial Bank has four Branches in Calgary, six in Edmonton, and over fifty throughout the Provinces of Alberta and Saskatchewan.

Managers of these Branches are eager to serve the Oil Industry's needs in every way possible.

Yours For Service

IMPERIAL BANK OF CANADA

J. W. McCormick

Pacific Pumps Increase Sales Force

The appointment of J. W. McCormick as sales engineer in the New York office is announced by E. J. Weis, vice president and director of sales of Pacific Pumps Inc., Los Angeles. Mr. McCormick is being transferred from the Los Angeles-San Francisco district.

E. Holley Poe

E. Holley Poe, prominent figure in the gas industry, died suddenly March 9 at Tulsa, Okla., his former home. Mr. Poe formed the Texas Eastern Transmission Corp., which purchased the big and little inch pipe lines from the government, and was its first president. In 1937 he came to New York as secretary of the natural gas department of the American Gas Association. During World War II he was director of the Natural Gas and Natural Gasoline Division of the PAW.

Mr. Poe was president and treasurer of American Gas Journal. He was a director of Texas Eastern Transmission Corp., vice president and director of Atlantic Venezuela Transmission Corp., vice president and treasurer of United States Pipe Line Co., chairman of the board of the Venezuela Research and Development Corp., chairman of the North American Petroleum Gas Corp., director of New Brunswick Oilfields, Ltd., and president of Northeast Utilities Equipment Corp., of Stamford, Conn.

Advertising Agencies Combine

Effective May 1 an advertising agency to be known as Marsteller, Gebhardt & Reed, Inc., will begin operations, combining the thirty-three year old Chicago agency of Gebhardt & Brockson, Inc., and the Pittsburgh office of The McCarty Co. The new company will be headed by E. A. Gebhardt, chairman; Wm. A. Marsteller, president, and R. S. Reed, Jr., executive vice president and manager of the Pittsburgh office.

Other operations of The McCarty Co., pioneer west coast agency, will not be affected. T. T. McCarty, head of The McCarty Co., and long identified with the advertising of the Nordstrom Valve Division of Rockwell Manufacturing Co., will continue to assist in the handling of the Nordstrom account.

Likewise, The Marsteller Co., Chicago marketing consultant firm established Jan. 1 by Mr. Marsteller will continue to be located at 612 N. Michigan Ave., Chicago. Marsteller, Gebhardt & Reed, Inc., will maintain offices at 600 S. Michigan Ave., Chicago, and at 600 Grant St., Pittsburgh.

Rockwell Names L. A. Dixon, Director

L. A. Dixon was elected a director of the Rockwell Manufacturing Co. at the last board meeting. He has been a vice president of Rockwell's meter and valve division since early 1948, and before that was president of the Pittsburgh-DuBois Co. which is now a division of the Rockwell firm.

Modern miracle in the desert

Controlling the flow of oil through 1068 miles of pipe line with minimum manpower is the job Westinghouse engineers were asked to tackle on the gigantic trans-Arabian oil project. Their answer is an ingenious Westinghouse electrical control system which keeps 300,000 barrels of petroleum a day flowing smoothly from oil fields near the Persian Gulf to storage tanks on the Mediterranean.

Five Westinghouse control stations along the line regulate the oil flow. One man at a master control board in each station directs the station operations through remote control . . . adding or siphoning off oil to increase or relieve pressure on the line. Protective devices automatically sound alarms or shut down units if something goes wrong. This modern electrical system replaces expensive and less efficient manual control methods which required large crews of men.

In addition, steam turbines for pumping . . . pipe-welding equipment . . . cathodic protection of pipelines . . . motor control centers for pipeline pumping service—provided by Westinghouse—helped to make possible this modern miracle in the desert. Such vital projects demonstrate the ability of Westinghouse to serve world industry.

Westinghouse leadership and experience in designing electrically controlled oil pipelines is on tap for similar projects anywhere—no matter how large or complex.

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WESTINGHOUSE ELECTRIC INTERNATIONAL COMPANY

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NELSON L. OTT, formerly vice president and treasurer, has been elected executive vice president of Coastal Oil Co. Mr. Ott became a member of the Coastal organization in 1942. He has been a director and continues in that capacity. Michael Archer, formerly manager of accounts, has been elected treasurer and Robert J. Marron has been appointed assistant general manager.

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Paul F. Barnhart

PAUL F. BARNHART, consulting petroleum engineer and independent oil operator, has opened his own offices, 1228 Commerce Building, Houston. He has been general manager of operations with Frank and George Frankel, independent oil operators, since 1942 and will continue to act as consultant to the Messrs. Frankel. Following his graduation from the University of Oklahoma as a petroleum engineer he was employed by Barnsdall Oil Co. from 1936 to 1942 in various positions in drilling and production operations.

THOMAS GEORGE REYNOLDS has joined the refinery division of Catalytic Construction Co., Philadelphia, as an executive engineer. Mr. Reynolds has been closely associated with petroleum engineering since 1929. Prior to joining Catalytic, Mr. Reynolds was a process engineer with United Engineers and Constructors of Philadelphia.

MAX STEINEKE, chief geological consultant to the Arabian American Oil Co., San Francisco, has been designated as recipient of the Sidney Powers Memorial Medal of The American Association of Petroleum Geologists, as announced today by A.A.P.G. president C. L. Moody. Presentation of the gold medal and scroll, signifying the highest honor in the science of petroleum geology, will be made in St. Louis, Mo., April 24, 1951, at the annual meeting of the association. The award gives recognition to Mr. Steincke's signal success in discovering and developing vast oil resources in Saudi Arabia. He also has done work in Point Barrow, Alaska; Queen Charlotte Island, British Columbia; the interior of Colombia and parts of Venezuela. In Colombia, and in Saudi Arabia particularly, his work has been geographical pioneering as well as geological pioneering.

B. E. HULL has retired as president of the Trans-Arabian Pipe Line Co. following completion of the three-year job of building the 1,068-mile line. Mr. Hull will later return to The Texas Co. where he will serve in an advisory capacity on pipe line matters. Mr. Hull, widely known as the "No. 1 pipeliner of the oil world," built the famed "Big Inch" and "Little Inch" lines from Texas to the East Coast during World War II. He is a veteran of 46 years of pipeline work. He joined The Texas Co. in 1905. In 1926, he was elected president and manager of The Texas Pipe Line Co. He also has been president and manager of The Texas-Empire Pipe Line Co., the Kaw Pipe Line Co., and The Texas-New Mexico Pipe Line Co. He became president of Tapline in July, 1946, and in March, 1947 was elected a vice president of The Texas Co.

MILLARD K. NEPTUNE, manager of Continental Oil Company's foreign department, has been granted leave of absence to serve as assistant director of production in the Petroleum Administration for Defense. He served the PAW during World War II.

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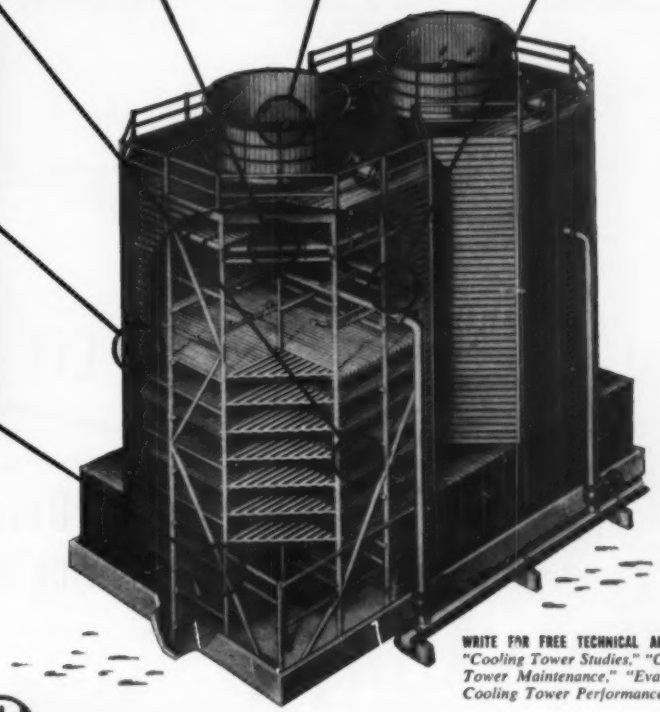

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Outlook of Gas Exports

(Continued from page 47)

gas exists from "the grass-roots down" to depths of more than 12,000 feet. How much deeper will be determined in days to come. The same can be said of crude oil which, not only in the form of seepages here and there, actually "sticks right out of the ground" as the famous Tar Sands of the Athabaska River, and has also been encountered at depths as great as 12,000 feet in the Foothills Belt of Alberta.

As stated, Dr. Hume's January, 1949, figure for proven recoverable gas reserves was roughly 4.3 trillion cubic feet. His September, 1950 proven reserves estimate was given as 6.3 trillion cubic feet. Thus, in some two years' time the reserves, calculated on the same general basis, were increased by two trillion cubic feet, and if that discovery rate were to continue the 10 trillion cubic feet of reserves will be reached before the end of 1954. With the more favorable and workable regulations with respect to gas permits and leases recently put into effect, it seems almost certain that more than 10 trillion cubic feet of natural gas reserves will have been established by 1954 even if the ultra conservative Alberta Conservation Board methods of calculation are employed.

Let us assume now that the green light for gas export will be given within a year's time by the Alberta government. The destination of this gas is in the hands of the federal government's Transport Commission in Ottawa, which is not placed there exclusively by the Alberta voters. If I were a resident of Vancouver, Winnipeg, Toronto or Montreal I would insist that the first consideration for export of Alberta gas be given to these cities. . . .

Under normal conditions the question whether or not gas should be taken from the reserves established in Alberta to markets outside that province is Alberta's concern. The destination of that gas is not. It seems to me that some of the other provinces, especially those where industry is concentrated, would wake up to the fact that a forward pass is about to be thrown, and that it would be nice to catch it lest someone else intercept the pass and run for a touchdown in the wrong direction. In other words, the natural gas reserves discovered to date and those yet to be discovered in Western Canada are not alone the concern of the province of Alberta, where

(Please turn to page 96)

Petroleos Mexicanos

(MEXICAN PETROLEUM ADMINISTRATION)

TO OUR CLIENTS AND SUPPLIERS:

In the operation, maintenance and expansion of the Mexican Petroleum Industry, vast quantities of materials and equipment of all kinds are now required, representing the outlay of very large sums of money. Likewise, our sales operations, for both, the domestic and the export markets, have reached extremely important figures.

This volume of operations and the commanding position of our industry in Latin America, have prompted the decision that we have reached to deal directly with the manufacturers or producers themselves without any intermediaries.

We therefore request that our customers and suppliers deal directly with us, either by approaching our New York office at 74 Trinity Place, New York City, or by direct correspondence or contact with our General Offices in Mexico City.

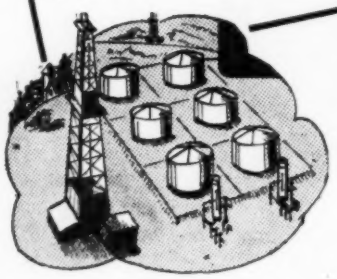
For major operations, direct correspondence with the undersigned is hereby respectfully and cordially requested.

Senator Antonio J. Bermúdez

GENERAL MANAGING DIRECTOR

Redwater Leaseholds Ltd.

Roxboro Oils Ltd.



Two Alberta Oil Producing Companies

With Active Development Programs Already Showing Worthwhile Potentials

Ellerslie Area

(6 miles south of Edmonton)

Redwater Leaseholds Ltd. owns a 25% interest in a full section on which the first test well is now producing. We have geological and engineering information that the entire section is well placed on this seismic structure, and that up to sixteen successful wells may be expected.

Campbell Area

(11 miles northwest of Edmonton)

Both companies have substantial interests in this 4100 acre farmout where eight wells are on production. Many more are scheduled to be drilled. The production for January was 6,770 barrels and for February 8,241 barrels.

Qualified *independent* engineers estimate *recoverable oil* from the drilled Campbell Wells at 1,345,000 barrels. This estimate *does not* include the balance of the 4100 acres or the offsetting locations soon to be drilled. This estimate *does not* include the Companies' production at Ellerslie.

Big Lake Area

(8 miles westerly of Edmonton and 4 miles north of the Acheson D-3 Discovery Well)

Roxboro Big Lake No. 1 Well struck gas in Lower Cretaceous at 3,700 feet. Conservatively estimated at 8,000,000 cu. ft. daily. Heavy saturation of oil. Drilling through to Devonian with excellent prospects of tapping the Acheson D-3 Extension. As at Mar. 5th well was drilling at 3930 ft.

Several wells will be drilled shortly in this area.

Roxboro owns and controls 200 acres on which No. 1 Well is now drilling. A success here would benefit Roxboro primarily, but also Redwater Leaseholds Ltd. as the well is close to the Campbell property.

Enquiries Invited.

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SHALLOW WELL DRILLING (4,500 ft.)
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We have records of it being used for drilling far beyond its rated capacity without a sign of trouble. Investigate the U-34D. Write for complete information or see your Supply Store.

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most have been discovered to date, but the reserves of this handy and clean source of energy are of vital importance to all those parts of Canada to which it can be transported commercially.

Railways and airlines are a great factor in tying together eastern and western Canada more effectively, and natural gas and oil pipe lines would serve as additional bonds to accomplish the same purpose. However, the final determining factor should be the one which will obtain the greatest over-all security for the people of North America against what today appears to be a threat to our way of democratic living.

Improvements in Gulf Cracker

The M. W. Kellogg Co. is building a fluid catalytic cracking unit for Gulf Oil Corp. at Port Arthur, Texas, which will have a reactor throughput of 60,000 barrels daily. The unit will incorporate a number of improvements designed to reduce installation costs and increase operating efficiency.

The regenerator will operate at higher temperatures thus permitting faster regeneration of catalyst and reducing the amount necessary to be circulated to maintain optimum reactor temperatures. Cost of catalyst carrier lines is reduced even though stainless steel is required.

Another design change is that the stripper is incorporated within the reactor and above instead of below the grid. Less supporting steel is required. The flue gas exhaust stack is supported above the regenerator again saving supporting members. A special vent suppresses noise from fuel gas venting.

Du Pont Service Representative

Frank Pusey has been assigned as automotive service representative of the eastern district office of Du Pont's petroleum chemicals division. His headquarters will be in New York. Mr. Pusey spent two years with the Allison Division of General Motors as field engineer and served 12 years as sales engineer for the Pure Oil Co. before he joined Du Pont Co. In his new post, Mr. Pusey's services will be available to petroleum and transportation companies concerned with automotive problems.

New Books

The Practice of Lubrication, by T. C. Thomsen; 4th edition, published 1951 by McGraw-Hill Book Co., XIV and 647 pages, $8.00.

This book is an engineering treatise on the origin, nature, the testing and application of lubricants. The present 4th edition was written in view of the remarkable development of engines and machinery produced during World War II which run at higher speeds, higher pressures, under extremes of heat and cold. As in previous editions the author presents the general principles of lubrication. In 36 chapters he describes the various kinds of lubricants, the laws of friction, lubricating appliances, the testing of lubricants in laboratory and practice, and the lubrication needs of all sorts of bearings and equipment.

Large attention is given to distillation and refining of lubricating oils, and the use of additives and inhibitors to give lubricating oils desirable properties. Special attention is given to solvent refining processes that are non-oxidizing, non-rusting, non-emulsifying, have good pour points, high viscosity index are non-forming and resist high pressures. Attention is given to the new high-class synthetic oils, to aircraft lubrication, and to recent startling developments in bearings. Copies available through WORLD PETROLEUM Book Department.

New Books

Oil Field Exploration and Development, by A. Beeby Thompson; 2nd edition in two volumes; published 1950 by Anglobooks, New York 17, N. Y. LXV, 1176 and 32 pages, $20.

Some 25 years ago this week work was compiled and published as a general survey of the petroleum industry. Vol. 1 (546 pages) is devoted to the general "Principles" underlying the industry such as distribution of petroleum on the earth, origin of oil, formation of oil fields and their characteristics, the geology of American, European, Asiatic, Australian and African oil fields, and the properties and treatment of petroleum.

Vol. II, "Practice," deals with the history of petroleum, location of oil wells, drilling and subsidiary operations, petroleum recovery, equipment, transportation, and natural gas. The author observes that while there have been stupendous changes in petroleum technology in the last 25 years the principles have scarcely altered, and he relies on appendices to bring the subject up to date while preserving the original text. With this understanding, his book is very readable and useful as a survey of world oil. To order write to WORLD PETROLEUM Book Dept., 2 West 45th St., New York 19.

Ideco Sells Supply Stores

International Derrick & Equipment Co. has sold its chain of 15 supply stores to the H. K. Porter Co. The Ideco stores will be consolidated with the Jarecki Supply Co. to form a new oilfield distribution organization, known as Jarecki International Supply Division, H. K. Porter Co. Inc. The new Porter organization will function as an authorized distributor of the complete line of Ideco oilfield equipment. Ideco will center its attentions on manufacturing.

3 AFFILIATED CANADIAN COMPANIES OFFER

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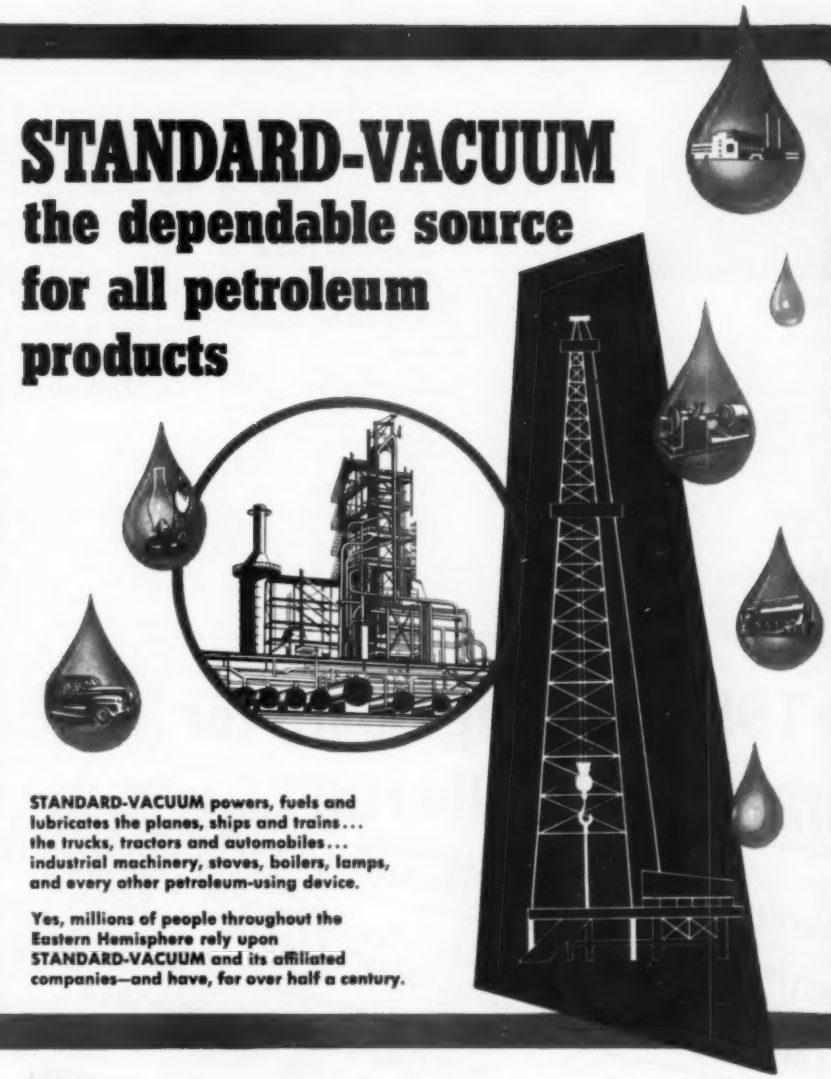

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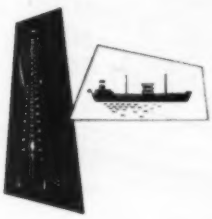
Yes, millions of people throughout the Eastern Hemisphere rely upon STANDARD-VACUUM and its affiliated companies—and have, for over half a century.



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SOUTH WEST AFRICA • TANGANYIKA • THAILAND • UNION OF SOUTH AFRICA

H. A. Grimes

H. A. GRIMES has been elected a director of Creole Petroleum Corp. to fill the vacancy left by the resignation of C. L. Burrill. Mr. Grimes has been in the oil industry for 28 years, most of which time was spent with Creole in Venezuela. He joined Creole in 1922 as a field engineer. With the exception of short temporary assignments in New York and a period of four years (1945-1949) when he was general manager of the International Petroleum Co. Ltd., in Peru, Mr. Grimes has been continuously with Creole in Venezuela. He has been a member of the management committee in Venezuela since March, 1950.

Venezuela Production

Venezuela produced over half a billion barrels of oil during 1950, for a gain of 13.5 percent over 1949. Relative output of past and present producing companies is shown by the following table of 1950 and cumulative production:

Company	1950	Cumulative
Creole	235,333,976	2,534,322,460
Shell Co.'s	168,524,709	1,865,441,488
Mene Grande	88,804,526	920,600,471
Texas-Mercedes	16,212,153	43,352,082
Socony	13,471,165	61,367,051
Atlantic	7,644,394	13,125,873
Sinclair	4,598,160	59,601,332
Richmond	4,562,286	6,402,849
Pantepec	4,496,237	7,666,170
Phillips	2,734,935	5,313,861
Guasare	23,595	75,079
NY & Bermudez	—	1,858,400
Tocuyo	—	791,174
Orinoco	—	627,049
New England	—	15,500
SFRV	—	9,343
BCO, Ltd.	368,167	30,881,523
	546,046,136	5,520,570,182

The industry-wide daily average for 1950 was 1,498,012 barrels, as compared with an average of 1,321,620 for 1949. The production curve was climbing upward at year's end, as these daily averages for December show:

Company	Eastern Venezuela	Western Venezuela	Total
Creole	143,102	556,720	699,822
Shell Co.'s	—	494,623	494,623
Mene Grande	213,126	59,062	272,188
Socony	47,182	—	47,182
Texas-Mercedes	30,105	15,723	45,828
Atlantic	19,560	—	19,560
Richmond	—	13,951	13,951
Pantepec	11,296	—	11,296
Sinclair	11,067	—	11,067
Phillips	5,294	—	5,294
BCO, Ltd	—	957	957
	*480,732	1,141,036	1,621,768

*Includes 41,739 barrels per day from Guarico

February was a hard month on wildcats in Venezuela. Two new-field tests in Western Venezuela were abandoned after lengthy testing programs, one of them being Atlantic's Guasare-1 the other Shell's DPE-1, both of them deep Cretaceous tests northwest of the Mara limestone field. In Guarico, Atlantic abandoned Monal-1, and Texas-Mercedes plugged the shallow holes Valle 23-1, Belen-3 and La Pascua-4. In Eastern Venezuela, Mene Grande's Macuare-1 and Chipo-1, and the joint Meneg-Creole Jonote-1, were failures, while Texas's Mata-1 was abandoned for mechanical reasons.

Shell's CQ-1 near Valera continued drilling, and British Controlled's El Mene EM-285 was testing at about 14,000 feet. In Guarico, Atlantic announced they would drill Mamon MGX-2, west of the Tucupido field, and (jointly with Socony) Anibal-1, in the southeast part of the state. Sinclair was moving in on Piedra Azul-1, north of Tucupido, as the month began. In Eastern Venezuela, Creole was drilling ahead on West Maron-1 and Guanoco-1, and Phillips was testing Laloma-2. Texas Co. spudded Mata-2, while Mene Grande had completed Cerro Pelado-1A and was drilling ahead on Boca-1, East Soto-1 and Chaparro-1.

Eighty-two rigs (excluding workovers) were operating in Venezuela in February, an increase of four over the January figure.

MAWAG Refinery On Stream

Reconstruction work on the war-damaged refinery of Mineraloel-und Asphaltwerke AG. (MAWAG) at Ostermoor near Brunsbuettelkoog on the Kiel-Canal has progressed so far that operations can now be resumed. The first tanker discharged a cargo of 12,500 tons of overseas crude in March which will be refined here to give motor fuels and bitumen. The location of the Mawag plant on the terminus of the Kiel-Canal (which connects the Baltic and the North Sea) is particularly favorable from the point of view of freight rates. The refinery will have an annual throughput capacity of 60,000 tons of crude.

On the 1951 Drawing Board for Natural Gas in Alberta.

Natural Gas is one of the important factors in making Alberta the industrial province of the West. Rates are among the lowest on the Continent. Last year customers increased from 77,000 to 86,000 and sales climbed from 35 billion cu. ft. to 45 billion cu. ft.—proof that in Albert, Natural Gas is backed by Good Gas Service.

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Capital Expenditure over $3 Million
Extend Services to Can. Cement Exshaw—also town of Banff
Connect Jumping Pound Additional Initial Capacity 20,000,000 C.F. per day
Services to New Customers 2,800, Ups total to 46,200
Drill 13 New Wells Viking-Kinsella Brings total to 80
Northwestern—
Capital Expenditure Approx. $3½ Million—
Extend Services to Approx. 4,600 New Customers Ups total to 47,500
Start 4th transmission Line to Edmonton—

For further information regarding Natural Gas, in Alberta write to:

Mr. S. C. Morison, Secretary, Canadian Western Natural Gas Co. Ltd., Calgary, Alberta

Mr. C. L. Metcalfe, Secretary, Northwestern Utilities, Limited Edmonton, Alberta

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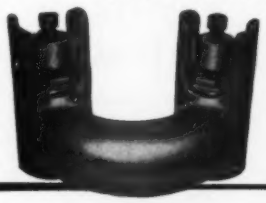

Made in 5% Chromium-Molybdenum Steel
Design Conditions:–
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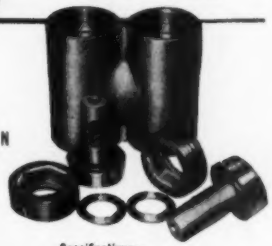
(7000 TYPE) FOR COMBINATION GASOLINE VAPORISER AND REBOILER HEATER



Made in Carbon Steel
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Millennium-Key Cast Steel Fittings for oil refinery and chemical plants are manufactured throughout at Braintree by Lake & Elliot, Ltd. Each stage of the process is carried out by specially trained personnel, from the making of the patterns and actual castings through to the final machining, fitting, testing and inspection. The pattern shop, steel foundry and machine shops are all adjacently located, so that close liaison is maintained during all stages of manufacture. The foundry and machine shops are kept equipped with the most up to date plant and machines, and close metallurgical control is maintained by a competent staff of chemists working with modern apparatus. The inspection Department is completely independent of all production departments, so that final inspection and acceptance may be undertaken for our Customers or can be carried out in conjunction with Customers' own Inspectors.

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LAKE-ELLIOT STEEL CASTINGS MILLENNIUM

New Platformer Announced

Taylor Refining Co., Taylor, Texas and Mayfair Minerals, Inc., McAllen, Texas, have announced plans to install a 4,000-barrel U.O.P. Platforming unit in their jointly owned refinery at Port Isabel, Texas. The Platforming unit will be designed to process a mixture of naphthas produced from coastal crudes and recycle distillates. The addition is part of a modernization and expansion program designed to permit the production of high octane gasoline.

Specifically designed for sawing thin sections from cores for microscopic study . . . holds tolerances of .002. Also used for splitting cores, squaring-up sections, etc. Widely acclaimed for its precision workmanship and economy.

WRITE FOR LITERATURE

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Dr. Santiago Vera Izquierdo, head of the newly-created Ministry of Mines and Hydrocarbons, opens a master valve of Shell's new gas-absorption plant at LaPaz, Western Venezuela, at official inauguration ceremonies. At the Minister's left is H. O. Ziekenheimer, plant superintendent. Background figure is Theodore Peuchen, district superintendent.

Eastern Products Pipe Line

The Buckeye Pipe Line Co. is considering a $23.4 million common carrier products pipe line from New York and Philadelphia refining area to eastern Pennsylvania and central New York State. The project contemplates the construction of a 14-inch line from Linden, N. J. to Allentown, Pa., where a junction would be made with the Tuscarora Oil Co. Ltd. line. An 8-inch line would be constructed from Marcus Hook, Pa. area to Allentown; a 12-inch line would be laid from Allentown north to the Syracuse, N. Y. area, and an 8-inch line would also extend from Auburn to Rochester, N. Y. Total mileage of the system would be about 430 miles and the initial capacity out of Linden, N. J. would approximate 80,000 barrels per day and out of the Marcus Hook area some 28,000 barrels per day.

To Drill for Pemex

The Isthmus Development Co. of Amarillo, Texas, has signed a contract with Petroleos Mexicanos to rehabilitate and drill wells in the Coatzacoalcos, Veracruz State, region of Mexico, it was announced in Mexico City by Jose Saldivar, the company's Mexican representative. Sr. Saldivar said the company will develop the Ixhuatlan, Teapa and Moloacan fields and added work will begin "immediately."

Syria Concession Abandoned

Syria Petroleum Co., a member of the IPC group, has notified the Syrian government of the abandonment of its concession to take effect in August next. The company's property together with accumulated geological and drilling information will be handed over to the government.

The concession was obtained in 1938, superseding exploration permits under which drilling had been carried out at several places and this work was extended prior to the world war to promising structures at Cherrife and Dubayat.

After the war, drilling was resumed and workshops and transport depots were established. Dry holes were drilled at Baffum, Dola'a, Abba, Ghouna, Djibissa and Gubeibe. Although some of these were carried to depths exceeding 10,000 feet no commercial prospects were discovered.

Pacific Petroleums Ltd.

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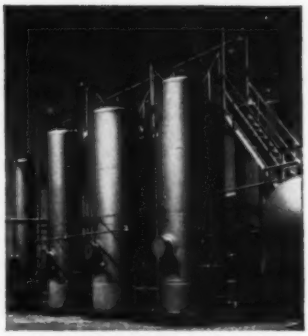

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DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

John A. Scott

JOHN A. SCOTT has been named manager of the newly created petroleum chemicals division of Sinclair Refining Co. With him will be associated a group of technologists largely drawn from the company's research laboratories at Harvey, Ill.

Mr. Scott joined Sinclair in 1934 as a research chemical engineer. In 1944 he was transferred to Corpus Christi, Texas, to aid in design and construction of the alkylation unit there. In 1945 he was made assistant to E. W. Isom, vice president in charge of research and development.

Initially the new Sinclair department will devote its energies largely to special products now manufactured such as aromatic solvents, lube additives, demulsifying agents and sulfonates.

Consider Line to Vancouver

Trans Mountain Oil Pipe Line Co. is seeking parliamentary approval to incorporate for the purpose of building a 75,000-barrel crude line from Edmonton to Vancouver. Proposed route of the 715-mile line would be entirely in Canada. Provision would be made for increasing line capacity to 200,000 barrels daily by adding pump stations.

Bechtel Corp. and Canadian Bechtel, Ltd., have been collaborating with both Canadian and United States associates in studying the proposal. Proposals now are to begin construction in July and complete the line by the end of 1952 according to S. D. Bechtel, chairman of Canadian Bechtel, Ltd.

Dividends Higher

Cash dividends declared in 1950 by 30 major oil companies may aggregate $68 million, an all-time high as well as an increase of 21.1 percent over the previous year, according to estimates of the Chase National Bank in a financial survey of a group of companies comprising about two-thirds of the petroleum industry of the United States. The dividends represent 41 percent of available 1950 earnings. In addition to these dividends, several companies declared stock dividends. Combined earnings of the 30 oil companies for 1950 may amount to $1,600 million, an increase of 18.3 percent over 1949. The third quarter of 1950 showed the greatest advance, with estimated earnings rising some 58.5 percent above those for the third quarter of the previous year.

Refinery For South Africa

Standard-Vacuum Co. will build a 10,000 barrel refinery near Durban, Union of South Africa, according to an announcement by L. W. Elliott, president of Standard-Vacuum. The refinery, which will cost about $12 million will be completed late in 1953 or early the following year.

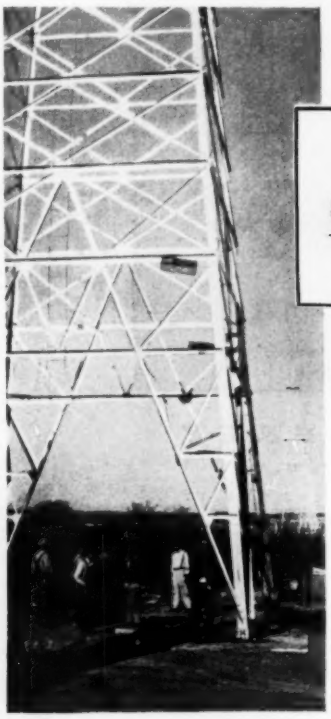
The refinery will be the first petroleum plant in the Union. It will be erected on a 200-acre site near Durban where deepwater terminal facilities now exist.

To Build Cat Cracker

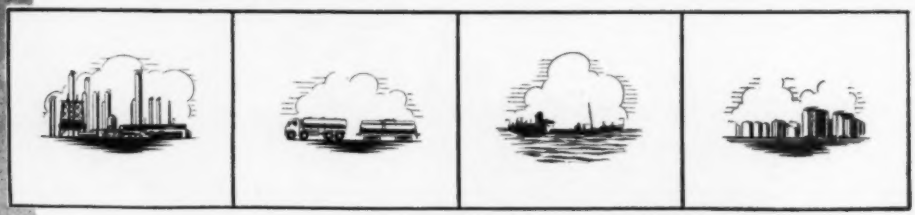
Phillips Petroleum Co. will erect a catalytic cracking unit at its Okmulgee, Okla., refinery. Included in this project will be a feed preparation unit and gas recovery unit. Completion is planned for May, 1952.

DR. DILWORTH T. ROGERS of the research division of the Standard Oil Development Co., has been appointed senior research associate. Dr. Rogers' research activities have been primarily concerned with additives for lubricating oils and fuels. These included detergents, oxidation inhibitors, pour point depressants, viscosity index improvers, and other chemicals. He has collaborated in the publication of various outstanding technical articles, and approximately 60 United States and foreign patents have been issued in his name.

Dr. Dilworth T. Rogers



...and then you need...



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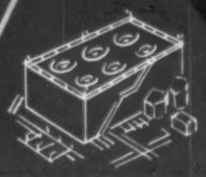

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complete petroleum refineries and chemical plants

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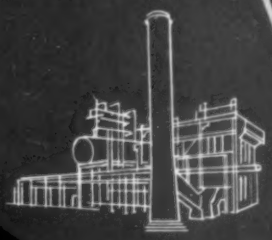
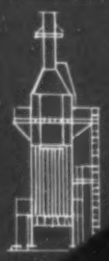


direct-fired heaters



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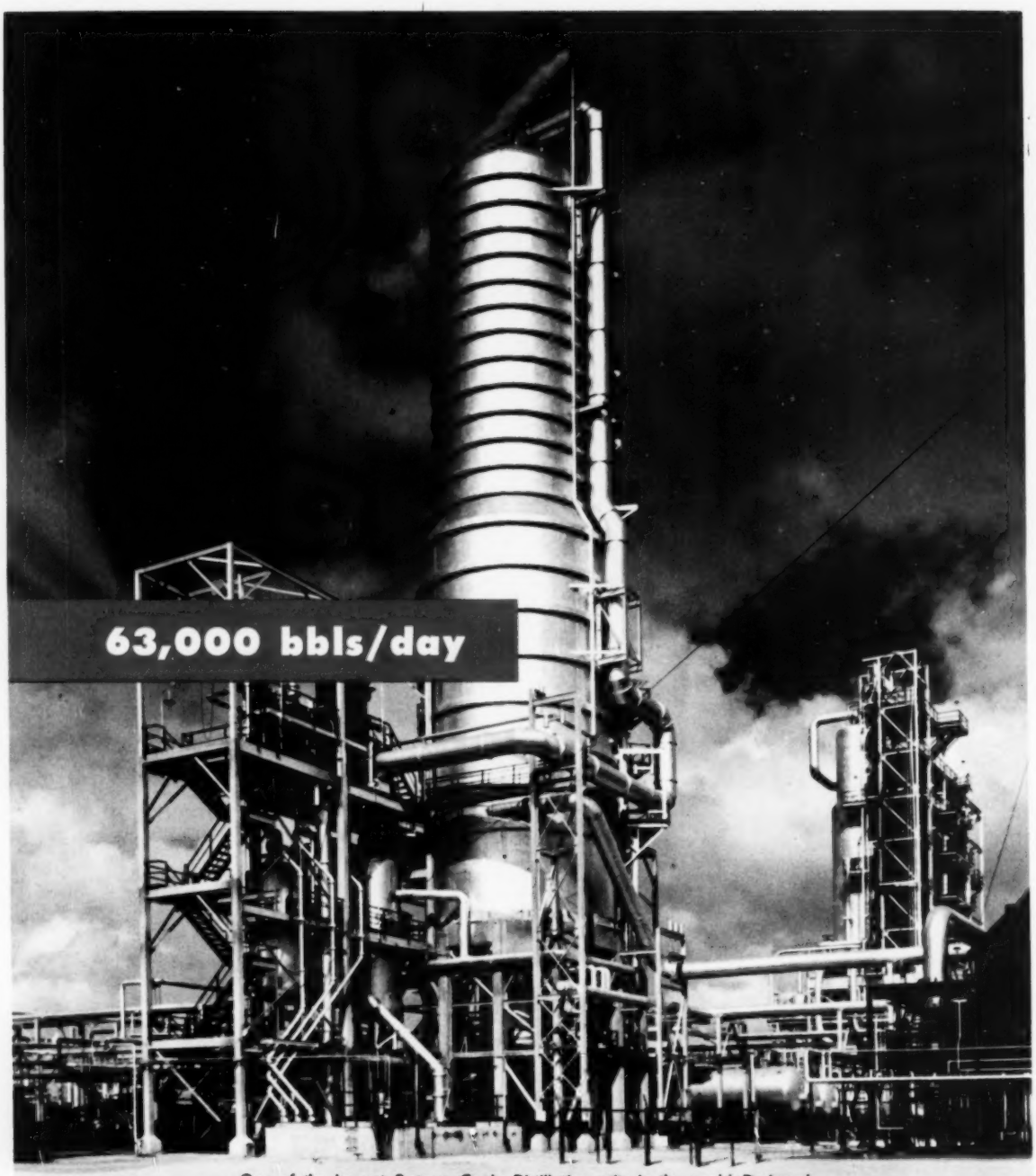

One of the largest 2-stage Crude Distillation units in the world. Designed and constructed by Foster Wheeler, this unit was recently placed in operation at the Amuay Bay, Venezuela refinery of the Creole Petroleum Corporation.

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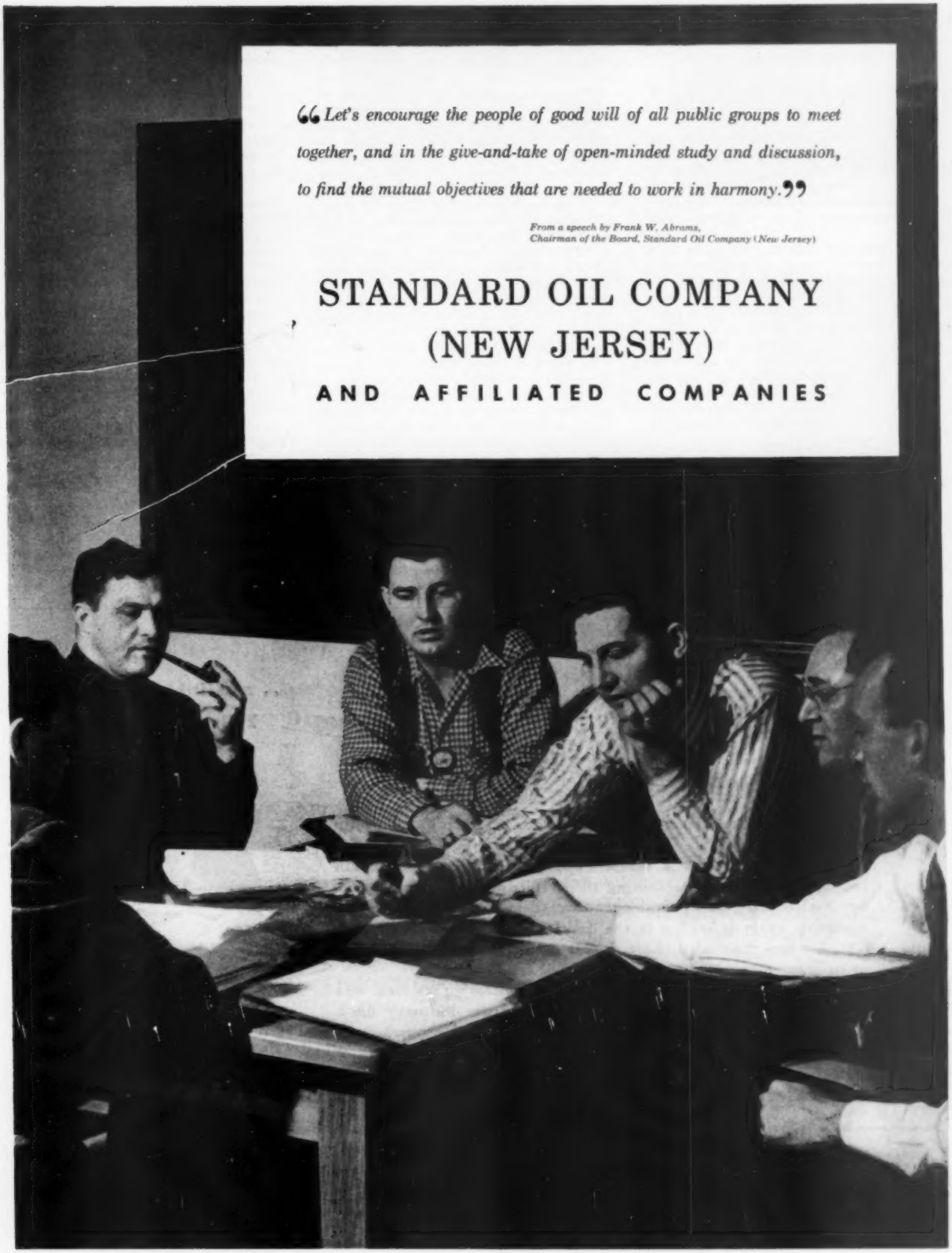
"Let's encourage the people of good will of all public groups to meet together, and in the give-and-take of open-minded study and discussion, to find the mutual objectives that are needed to work in harmony."
From a speech by Frank W. Abrams, Chairman of the Board, Standard Oil Company (New Jersey)
STANDARD OIL COMPANY
(NEW JERSEY)
AND AFFILIATED COMPANIES

Strategic Importance of Canadian Oil

(Continued from page 55)

line was initiated during the war as a defense measure and has recently been doubled in capacity.

Two considerations now under review may have a bearing on the possibility of bringing Alberta crude to Montreal refineries. One of these is the new proposed product pipeline between Montreal and Toronto. The other is the construction of the St. Lawrence Seaway.

It is estimated that the completion of a 27-foot seaway through to Montreal would cut transportation costs by something between 10 or 20 cents a barrel. It would probably eliminate any thought of a crude line linking Alberta with Montreal. Extension of a product line from Montreal to Toronto would tend to reduce the setback for Alberta Oil in Ontario by making Venezuela crude more competitive in that market.

In summary, here are some generalizations put forward by one expert in appraising the Canadian picture:

(1) Preliminary investigation indicates that the Alberta field price required to compete in the various possible markets does not vary greatly between markets.

(2) While pipeline investments to reach the markets vary, the differences may not be significant if capital and material is available. If the appropriate volume of crude is handled, the pipelines would be able to pay their way.

(3) After the saturation of the Ontario market, the effect on Canadian crude of any changes in the United States customs tariff will probably be the same for all destinations. A higher tariff would depress the price of Caribbean and other crudes whose main market is in the United States. This would bring lower laid-down crude prices at Montreal. As a result, movement of crude to Montreal would be affected in the same way as if the crude were sent direct to United States markets.

(4) There are substantial differences in the size of markets, the west coast being the biggest. On the other hand, the largest amount of refinery capacity in existence at the present time is at Montreal. For both the west coast and Minneapolis a substantial refinery investment must be made to provide a sizeable crude outlet. However, in the future prairie crude may prove to be the most logical supply to these markets and it may be desirable for it to be priced at a level which would warrant the required refinery investment.

(5) The North American continent should logically be viewed as a unit from an oil supply standpoint. It is generally recognized that imports to the continental area will be necessary from now on. It would seem that these imports should be determined on the basis of the overall economy having regard to a prudent level of production from reserves.

Against this sober and commonsense appraisal, at least two important factors are pulling in contrary direction. One of these is the protective sentiment in Congress. The other is a persistent "nationalist" sentiment in Canada supporting conservation of natural resources for the use of Canadians.

It is not for Canadians to express positive opinions on what is likely to come out of Congress in respect to tariffs and other protective devices in the immediate future. Certainly most Canadians hold to the view that by reason of the reciprocal trade program of the past sixteen years, the trade and commercial relations of Canada and the United States have been greatly strengthened. And there is also a belief in almost all parts of Canada that this has been of mutual advantage. Most Canadians incline now to the view that further extension of this reciprocal program would be in the interest of both countries.

There is an equally strong sentiment however, in Canada that favors a larger "upgrading" of Canadian natural resources so far as their export is concerned. This has not been widely expressed, so far, in respect to crude oil. But it is being given free rein in pulp and paper products, metals, iron ore and natural gas. It means that there is growing concern against exporting these valuable resources in too crude a form.

Thus for almost two years, Canadian parliamentarians staged a determined filibuster against granting charters to firms which planned to export Alberta natural gas direct to the Pacific Northwest. Much of the argument centered around preference for an all-

(Please turn to page 108)

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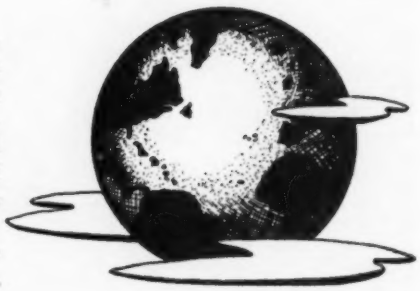

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Canadian route, or at least a route which would look after domestic needs first.

More recently, there has been strong support in Canada for new proposals that would pipe Alberta natural gas eastward instead of south to the United States. Application was made to the Canadian Parliament in March for a proposal to take gas directly to Winnipeg, Toronto and Montreal. Such proposals doubtless run counter to the economics of transportation. They would probably not be considered if there were no international border at the 49th parallel.

But Canadians with long memories remember a situation fifty years ago when surplus electric power for which Canada at that time had little or no use, was sold across the Niagara Falls border to United States concerns. As Canada began to need the power herself, it was found quite impossible to regain it—even during the extreme shortages of the last war.

Strategic considerations may, temporarily, gloss over basic political facts. And there is no doubt that the defense emergencies of the past decade have brought the two countries together to a considerable degree.

Today, the Korean crisis and subsequent declarations of emergency authority in both Canada and the United States, have chiefly given fresh impetus to plans already underway. But, as yet, there has been no critical change in planning or in the performance of programs which had been under consideration or underway before Korea.

What's going on now in Ottawa and Washington is a program which looks on the Alberta field as "a good start." The aim is to give the green light wherever possible to every exploration and development which will extend and expand the field as rapidly as possible.

Perhaps the only shift in emphasis that is presently detectable, is to give preference to oil rather than gas development. The reason for this is that a given pipeline will take five times the amount of energy in the form of oil as compared with gas. This doesn't mean that Canadian gas development will be halted. It does mean that where there is preference and priority, the development of oil will have the edge.

There is one further consideration which must not be overlooked. That is, the very rapid increase in the Canadian domestic market for oil and oil products. In 1951, Canadians will spend close to a billion dollars for gasoline, oil and oil products. This is $72 per capita.

Between 1939 and 1949, Canadians upped their consumption of petroleum products by 77 percent. The corresponding increase in United States and United Kingdom was 57 percent and 34 percent respectively. National consumption which was about 170 gallons per capita in 1939 had risen in ten years to 300 gallons.

Since the Alberta discoveries the gain has been even sharper. Thus in 1950, despite the very sharp increase in availability of domestic crude, Canada imported $309 million of oil and oil products. This is the highest figure in history. It compares with imports valued at about $65 million in 1938.

Some indication of consumption in recent years is shown in the following table:

Actual and Estimated Consumption of Refined Petroleum Products in Canada

(Thousand Barrels a Day)

	1946	1949	1950	1951	1953
Motor gasoline	90	121	130	137	149
Heavy fuel oil	47	62	65	66	68
Domestic heating oil:					
(a) Light fuel oil	14	23	26	32	36
(b) Stove oil	8	13	14	14	16
Diesel fuel oil	12	21	26	34	50
Asphalt	8	11	12	12	13
Lubricating oil	5	6	6	7	7
Aviation gasoline	1	3	4	*4	*5
Greases, wax cake	11	14	13	14	15
Refinery consumption	21	24	26	28	33
Misc. products	8	25	21	18	18
	225	323	343	369	410

*Pre-Korea estimate.

Gas Industry Council Set Up

Secretary of the Interior Chapman has established the Gas Industry Advisory Council to serve during the present emergency and has appointed 61 members representative of gas industries from all sections of the country. The purpose as stated by the Secretary is to enable him to obtain "advice and counsel from the gas industry both natural and manufactured, in connection with the discharge of defense responsibilities."

The action was taken in response to requests from officials of gas companies, particularly those handling manufactured gas, who felt that they were inadequately represented and that their needs might be subordinated under the previously existing set up. An organization meeting of the Council is to be held at an early date.

Secretary Chapman also has appointed C. P. Rather, president of the Southern Natural Gas Co. of Birmingham, Ala. as assistant deputy director of PAD—charge of gas matters.

Announcement

AS OF DECEMBER 30th 1950, THE FOUR COMPANIES KNOWN AS

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- LEDUC-WEST OIL COMPANY LTD.
- EAST-LEDUC OIL COMPANY LTD.

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The land is cleared

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for Plant and yet more Plant. In this country, Harveys of London have thrown in all their vast resources of men, material and "know how"

A railway is built

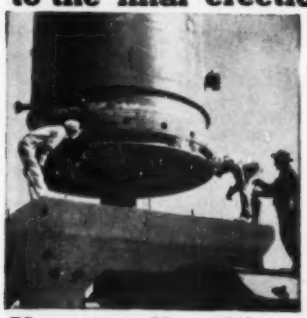
A column arrives

and have so geared production that they are meeting this huge demand with ever-increasing results which will bring benefit to millions.

Off loaded on site

It is gently raised

And so we see, stage by stage, from the clearing of virgin land to the final erection, a history of one of these Fractionating Columns.



and lowered into position

to start immediate production

Necessarily, this pictorial explanation is much condensed, but even so, it clearly evidences another triumph of British Engineering enterprise.

From the Shell Library come these scenes **Harvey** *from various stages in the production and transport of one of these huge Fractionating columns.*

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Economic Exploitation of Tar Sands

(Continued from page 64)

was reduced from 81 to 16 percent and gravity increased from 16 to 26.2 API.

The hydrogenated desulfurized product would fractionate to produce about 14 percent gasoline and 86 percent gas oil. Tests have indicated that the gas oil is suitable as catalytic cracking stock. Pilot plant runs showed the following yields: C_4s 12.7 percent debutanized gasoline 39.3 percent, light cycle oil 28.6 percent and heavy cycle oil 15.8 percent.

The cracked gasoline would have an estimated octane number of 92 research clear compared with 58 for the original distillate. With 2.5cc/gal of TEL the octane rating is 97 as compared with 75 for the original distillate.

Summarizing costs of the various steps necessary to deliver a mixed stream of desulfurized oil to the head of navigation at Superior, Mr. Blair suggests that mining will cost 55 cents per barrel of distillate, processing $1.53 and transportation $1.02. No allowance was made in the estimates for interest on investment or profit on mining and manufacturing costs but depreciation is figured at 10 percent. Capital required for mining is estimated at $2 million; processing and ancillary equipment $43.6 million. Assuming a mark-up of 40 cents per barrel of distillate to $3.50 it is calculated that a capital return between five and six percent would be provided.

Mr. Blair recommends that the government continue studies of mining and manufacturing methods and make further surveys to determine the extent of reserves. Co-ordination of various research projects is suggested under a general program which would include fundamental research. It is recommended also that an effective executive policy for the resource should be adopted.

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- Non-Metallic Sealing Orifice Plate.
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Illustration at right shows a Daniel 30 inch 600 lb. A.S.A. (1000 lb. C.W.P.) fitting being installed in the field for main line measurement. This Daniel fitting is the largest high pressure orifice fitting ever manufactured. Alloy steel construction with an orifice plate ½ inch thick. Total weight 9750 lbs.

Exclusive Daniel design features permit manufacture of sizes from 2 to 30 inches, working pressure range 0 to 6000 lbs. C.W.P.

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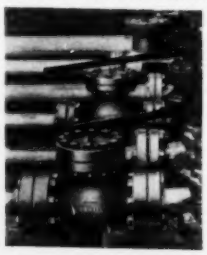

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Ralph R. Newquist — Robert H. Owens

Owens Heads Roots-Connersville

Robert H. Owens has been elected president and general manager of Roots-Connersville Blower Corp. succeeding John Avery. Mr. Owens came to Connersville in 1925. In 1946 he was named vice-president in charge of engineering and manufacturing, and in July 1948 a director.

Ralph R. Newquist, who became vice-president in charge of sales for Roots-Connersville in May 1946 has been elected executive vice president. Roots-Connersville Blower Corp. is a subsidiary of the Dresser Industries, Inc., whose headquarters are in Dallas, Texas.

Names Lee Laird California Sales Manager

Lee Laird has been made California sales manager for the Baash-Ross Tool Co. Mr. Laird is a past president and senior regent of the Los Angeles chapter of Nomads, as well as secretary-treasurer of the national board of regents of that organization.

Returns to United States

Wallace B. Phillips, chairman of The Pyrene Co. Ltd., was honored with a dinner at the Savoy Hotel, London, recently. The dinner was tendered by Pyrene directors on the occasion of Mr. Phillips return to the United States to become president of the Pyrene Manufacturing Co. of America. Mr. Phillips has been actively in business in Great Britain for over forty years. He founded the present Pyrene Company Ltd. in 1914. Aside from his business interests Mr. Phillips is, first and foremost, a humanitarian. He is a founder of the safety first movement in Great Britain. In 1943 he was elected president of the American Chamber of Commerce in London and throughout the intervening period has worked indefatigably to aid trade relations between Great Britain and the United States. He is shortly retiring as president of the Chamber.

He has just completed a term as president of the American Society in London. For many years he has been a member of the executive council of the National Union of Manufacturers and of the executive committee of the Pilgrims Society of Great Britain, a governor of the American Club and is a member of many other societies and clubs. During World War II he was appointed director of special information services of the O.S.S. with headquarters in Washington, New York and London.

W. T. Nightingale

W. T. NIGHTINGALE has been elected president of Mountain Fuel Supply Co., Salt Lake City, to succeed J. C. Donnell II of Findlay, Ohio, who was made chairman. Mr. Nightingale has been vice president in charge of production, exploration and transmission.

T. B. Gregory of Pittsburgh, has resigned as chairman and treasurer but will continue as a director. He was succeeded as treasurer by L. C. Olphin who has been assistant treasurer since Mountain States was organized in 1935 and secretary since 1942.

ANTHONY J. ZINO, JR., has been appointed assistant to the president of Swan-Finch Oil Corp. He was promoted from sales promotion manager and chief lubrication sales engineer.

GEORGE P. BUNN has been appointed manager of the natural gasoline department of Phillips Petroleum Co. He succeeds F. E. Rice, retired. A. M. Rippel has been named manager of the gas department. Previously both branches were under Mr. Rice's jurisdiction.

COURTNEY C. BROWN, assistant manager of the coordination and economics department of Standard Oil Co. (N.J.), has been appointed to a newly created position of assistant to the chairman of the board of directors. The appointment was effective March 1. Dr. Brown left the economics faculty at Columbia University in 1941 to join the Chase National Bank as associate director of research. With the opening of World War II, he moved to Washington, D. C., where he served from 1941 to 1945 as a vice president in charge of foreign activities of the Commodity Credit Corp. Dept. of Agriculture, and later as chief of the Division of War Supply and Resources, Dept. of State. He joined Jersey Standard in 1946.

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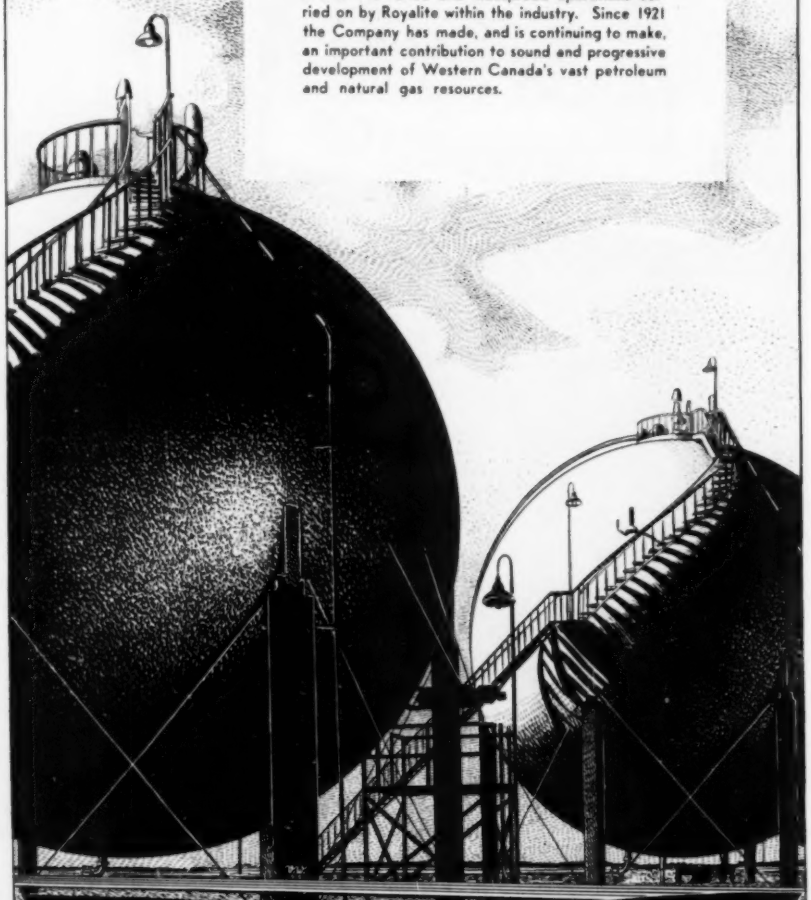

Royalite Oil Company, *Limited*

Head Office: Calgary, Alberta, Canada

EXPLORATION - DRILLING - PRODUCTION - PIPELINES - NATURAL GAS

The Gas Situation in Alberta

(Continued from page 46)

Table II. In view of the fact that the Bluesky well drilled four and one-half miles farther to the southeast also found gas in the same horizon, and considering the great thickness of the productive zone in the Whitelaw well, it is evident that a large reserve exists in this area. From presently available information it appears that the reserve in the Whitelaw field will be very much larger than that shown, and present indications are that this reserve will exceed a trillion cubic feet. The figures in the table show marketable gas or, as the Board has termed it, disposable gas.

There are four separate areas which may serve as markets for Alberta gas. These are the Pacific Northwest, the western Montana area, the Regina-Winnipeg-Minnesota market, and the Montreal-Toronto market. The largest of these markets is in the Montreal-Toronto area, where fuels being used at the present time are expensive, and where very little natural gas is available from the depleted fields of south-western Ontario. The needs of this area have been estimated as being in excess of 365 million cubic feet per day.

The second largest market area is the Pacific Northwest, where the largest cities are Vancouver, British Columbia, Portland and Seattle. In addition, there are some fairly large towns between the large centers. The average daily market demand in this area amounts to about 215 million cubic feet, and the maximum daily requirement during the year may be as high as 300 million cubic feet.

The Western Pipelines' estimate of average daily market requirements in the Regina-Winnipeg-Minnesota market area is 160 million cubic feet. Of this amount, about 54 million cubic feet per day would be Canadian requirements to service the cities of Moosejaw, Regina, Brandon, Winnipeg and others. The remainder would be American requirements mainly in the state of Minnesota extending as far east as the city of Duluth.

The principal markets in the western Montana area are the cities of Great Falls, Helena and Butte, Montana, and the various large mining, smelting and refinery operations of the Anaconda Copper Mining Co. and the American Smelting & Refining Co. located at Butte, Anaconda, Great Falls and east of Helena. These requirements have until this time been supplied by the Montana gas fields, mainly from the Cutbank field just south of the Alberta boundary. The Montana

Table II

Gas Reserves of Alberta
Billions of Cubic Feet

(See Map)

Leduc	576	
Viking-Kinsella	842	
Turner Valley	300	
Pincher Creek	1,252	
Jumping Pound	671	
Provost	100	
Medicine Hat	341	
Pendant D'Oreille	257	
Manyberries	100	
Pouce Coupe	113	(in Alberta)
Morinville—Legal	267	
Whitelaw Well	272	
Other pools	816	
	5,907	

(Please turn to page 114)

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Power Commission Company estimates that it will require on the average about 27 million cubic feet per day or about 10 billion cubic feet of gas per year from Canadian sources. The total market in the area is about 20 billion cubic feet per year. The estimated maximum daily requirements for this line from Canada was placed at 50 million cubic feet per day.

Westcoast Transmission Company, an affiliate of Pacific Petroleums Ltd., has proposed an all-Canadian route to Vancouver from the Peace River district. It intends to use as its main supply, the Pouce Coupe gas field and the newly-discovered Whitelaw field. Westcoast Transmission Company is now piping gas in the Pouce Coupe field, which lies mainly in the province of Alberta, to the nearby town of Dawson Creek in British Columbia. This is the first grant for export of gas to an area outside Alberta. It is the intention of the company to extend and use this line to supply the cities of Vancouver in British Columbia, Seattle, Portland and neighboring areas in the United States.

The Northwest Natural Gas Company, a United States corporation with two Canadian subsidiary affiliates, the Alberta Natural Gas Company and Alberta Natural Gas Grid Company, plans to construct a collecting grid to the various Alberta fields, and then build a line through the Crows Nest Pass to Kingsgate, British Columbia, thence southwesterly to a point near Spokane to supply the same markets as proposed by the Westcoast Transmission Company. The Northwest Natural Gas Company have outlined five alternate routes, all of which pass out of the southern part of the province, and have the Pincher Creek gas field as the main source of supply.

The Prairie Pipeline Company, with a Canadian charter, originally proposed to follow the same route and serve the same markets as the Northwest Natural Gas Company. However, in the fall of 1950, this company changed its plans and became affiliated with a subsidiary, Pacific Northwest Pipeline Corp. of Houston, Texas, which is associated with the Fish Engineering Company. These companies propose to build a 2,175-mile pipe line from Wharton County, Texas, to serve the Pacific Northwest states and the British Columbia market. The Pacific Northwest Company proposes to obtain such natural gas as is available from Alberta up to an additional total of one hundred million cubic feet per day. The Prairie Pipeline Company would be the producing company in Canada. Western Pipelines plans to transmit gas from Alberta to points in Saskatchewan and Manitoba, including Regina, Saskatoon, Prince Albert and Winnipeg. This company also plans to extend its line into Minnesota to supply some of the markets in that area.

Canadian Delhi Oil Ltd., which is a Calgary based subsidiary of the Delhi Oil Corporation of Dallas, Texas, is the latest company to enter the race for permission to take natural gas out of the province. The company has formed Trans-Canada Pipelines Ltd., which proposes to construct a natural gas pipe line extending 2,130 miles eastward from southern Alberta to Montreal. This line would serve the markets in Saskatchewan, Manitoba, Ontario and Quebec. The proposed route is through Regina and Winnipeg along the main line of the Canadian Pacific Railway north of the Great Lakes to Fort William, to Toronto, then eastward again to Montreal. The cost of the project would be in the vicinity of two hundred million dollars.

Canada-Montana Gas Company has been formed by the McColl-Frontenac Oil Company, Ltd. and the Montana Power Company, for the purpose of acquiring the Pendant D'Oreille gas field in southeastern Alberta, jointly owned by McColl-Frontenac and Union Oil of California, and exporting this natural gas to the Montana markets. A gas line already exists in Montana and extends to near the Canada-United States border at the Cutbank gas field. The proposal is to build a line connecting the Manyberries, Pendant D'Oreille and Cutbank fields.

The Alberta Interfield Gas Lines has been formed to erect one province-wide natural gas gathering system or grid. The company would act as a common purchaser and carrier, and would deliver natural gas to companies for domestic use and export. It is maintained that such a grid system is not economically

(Please turn to page 116)

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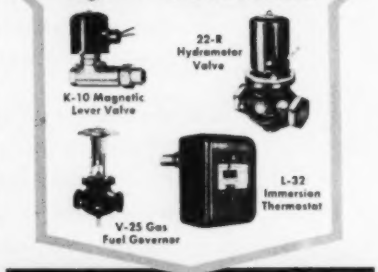

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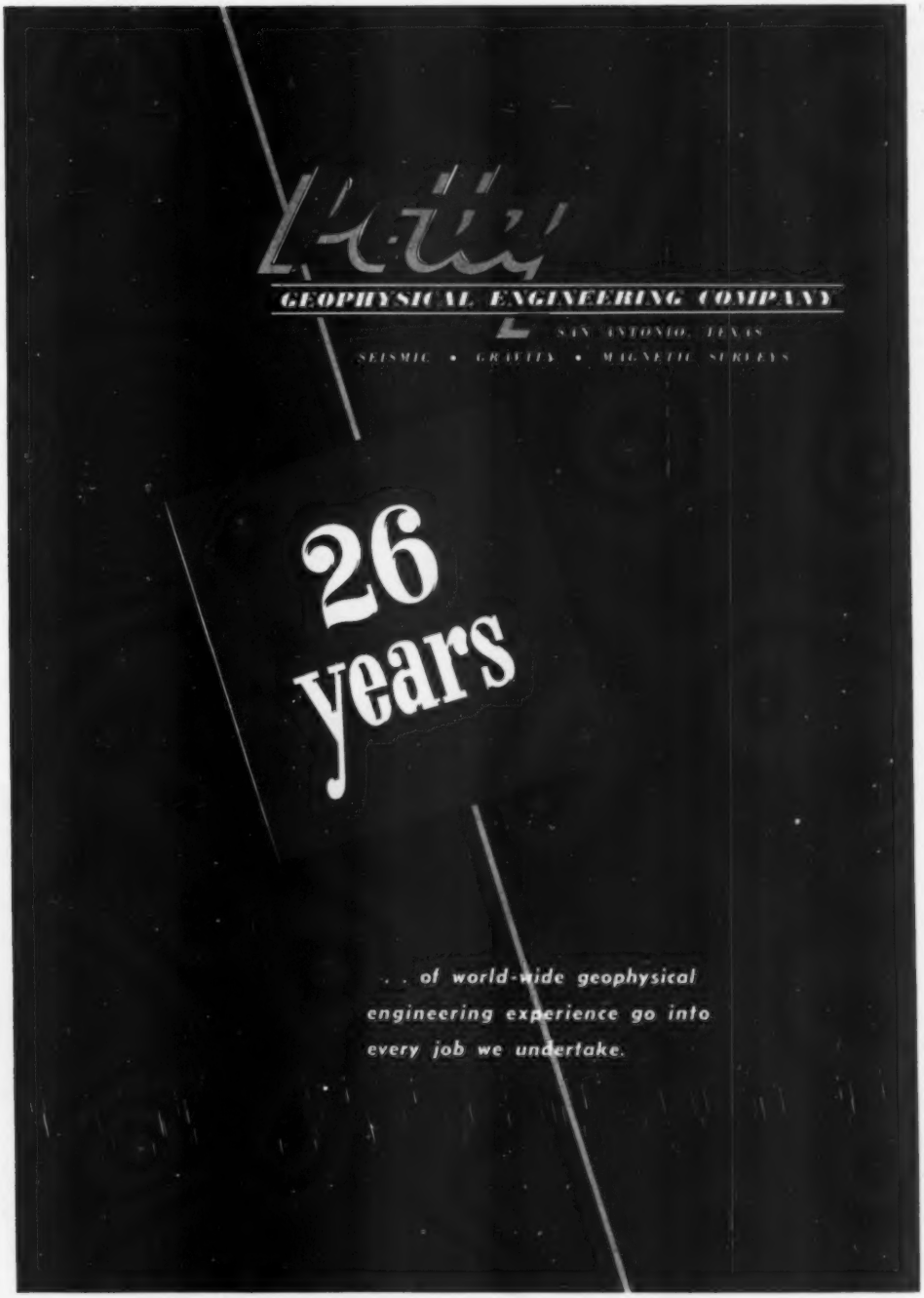
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Alberta markets are supplied by two subsidiaries of International Utilities Corporation. These subsidiaries are the Canadian Western Natural Gas Company, which supplies the city of Calgary, and Northwestern Utilities which supplies the city of Edmonton. These companies also supply the various towns along the routes of their pipe lines.

Evidence on the probable future natural gas requirements of Alberta was presented before the Petroleum and Natural Gas Conservation Board by Westcoast Transmission Company, the Northwest Natural Gas Company, the Canadian Western and Northwestern Utilities companies, the Research Council of Alberta and by J. R. Donald with respect to industrial requirements, and by the Alberta Power Commission with respect to the requirements of gas for power generation.

The estimates of Westcoast Transmission Company, Northwest Natural Gas Company and the two utilities companies for the two major distribution systems of the province are shown in Table III.

Mr. Donald suggested that the total demand for gas would probably double every ten years. He estimates that the applications of the utility companies were based upon increases in demand more or less proportionate to contemplated population increases with provisions for additional industrialization in the province. The evidence of the Research Council of Alberta, the Power Commission and Mr. Donald, suggested a greater industrial requirement than given in evidence by the other companies. The Board estimated Alberta's

Table III

	Requirements for 30 years, billions of cubic feet
Westcoast Transmission Co.	2,093
Northwest Natural Gas Co.	1,962
Utility companies	2,208

The estimated requirements for the entire province were as follows:

	Requirements for 30 years, billions of cubic feet
Westcoast Transmission Co.	2,303
Northwest Natural Gas Co.	2,142
Utility companies	2,418

future requirements for the next thirty years as follows: domestic, 873.7 billion cubic feet; commercial, 751.7 billion cubic feet; industrial, 1,434.5 billion cubic feet; total 3,059.9 billion cubic feet. This figure is much higher than any of the other estimates and contains a provision for considerable possible industrial expansion within the province of Alberta, and it is noted that the larger proportion of the gas is to be used to supply industrial requirements.

The Alberta government concluded that approximately four and one-half trillion cubic feet of gas would be required to be set aside in order to guarantee a delivery of three trillion cubic feet of gas within the next thirty years; that the amount of proved gas reserves within the province was equal to the provincial requirements for the next 30 years, and consequently there was no exportable surplus. The Alberta government will approve natural gas exports from the province as fast as proved gas reserves can be raised to a surplus level, and perhaps even sooner if the international defense situation requires it.

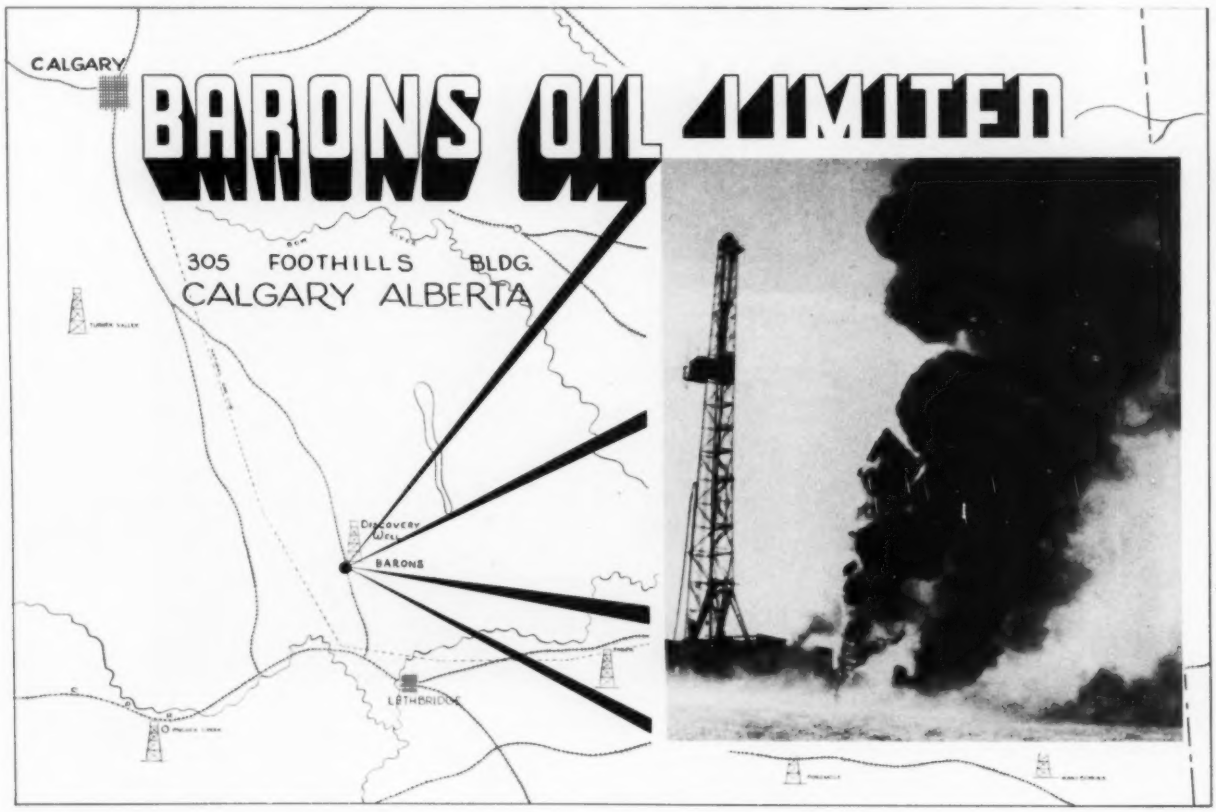
Alberta's gas reserves have expanded rapidly in the recent years and are now, according to the Alberta government, up to the level required to take care of the province's own requirements. As the reserves expand farther, a surplus will become available and the government is in favor of its export. To speed the day of export, new legislation more favorable to the oil industry will be provided immediately by the government to encourage the exploration for and development of Alberta gas reserves.

Glenn W. Christopher

Glenn W. Christopher, manager of standard pipe sales for The Youngstown Sheet and Tube Co., died in a Youngstown, Ohio, hospital February 13, after an illness of a year. He joined the company in 1910 as a stenographer in the wire sales department. He was appointed manager of standard pipe sales in 1947.

To Build Houdriflow Unit In Germany

Gewerkschaft Erdol-Raffinerie Emsland, a German petroleum company, will install a Houdriflow catalytic cracking unit at its new refinery in Lingen, Germany, a short distance from the Dutch border. The Lingen installation, which will be located in the new Emsland oil field, will be the first of the modern Houdriflow moving-bed units to be built in Europe. A Houdry fixed-bed unit, located in Berre, France, has been operating for several years and is the only catalytic cracking unit in operation in Europe.



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To Build Lube Plant

Pemex which last year spent nearly half the money it collected from oil exports on the importation of lubricants and petroleum by-products, is studying bids from five United States companies for construction of a major lubricant plant at the Antonio M. Amor refinery in Salamanca, Guanajuato State, according to Pemex officials. During 1950, Pemex imported 321,940 barrels of lubricants of all types as well as over 170,000 barrels of paraffin.

A large share of the $23,500,000 Pemex spent last year on oil imports also went for 102,716 barrels of asphalt. United States oil men in Mexico City report a group of five U. S. promoters is attempting to sign an asphalt contract with Pemex. The report, which could not be confirmed in Pemex, declares the old La Norma refinery, located about 28 kilometers from Tampico, will be put into operation to make asphalt using 14-gravity oil. The oil would be taken from six wells that have been shut down since pre-expropriation days when The Texas Co. cemented them after they had produced less than 200 barrels a day. The report adds the new company, to be called "Quimicos de Tampico" will re-open the wells and produce asphalt for Pemex on a percentage basis.

Pemex Seeks Pipe

Petroleos Mexicanos has ordered $35-million worth of sixteen-inch pipe from the Kaiser Steel Co., it has been learned by **World Petroleum.** The order calls for delivery of a total of 1,115,000 feet, with the first shipment scheduled to arrive in August. It is also reported Pemex has asked Kaiser for $10-million in credit to complete pipe lines now under construction but this could not be confirmed.

Both the Trans-Isthmus oil line and the gas line from Torreon to Monterrey have been held up consistently because of material shortages. Executives of Continental America, Pemex' pipe-laying contractor for the Torreon-Monterrey line, said their work has been virtually at a halt for the past several weeks. They said they are laying about three quarters of a mile a day and still lack about 250 miles before reaching Monterrey. The Trans-Isthmus line, orginally slated for completion by February 1, now is expected to be finished about April 1.

Brazil May Buy Mexican Oil

Brazil may purchase $100 million worth of petroleum and products from Mexico annually as the outcome of Pemex director Antonio J. Bermudez' current South American tour, it was indicated in Mexico City by Antonio Camillo de Oliveira, Brazilian Ambassador to Mexico.

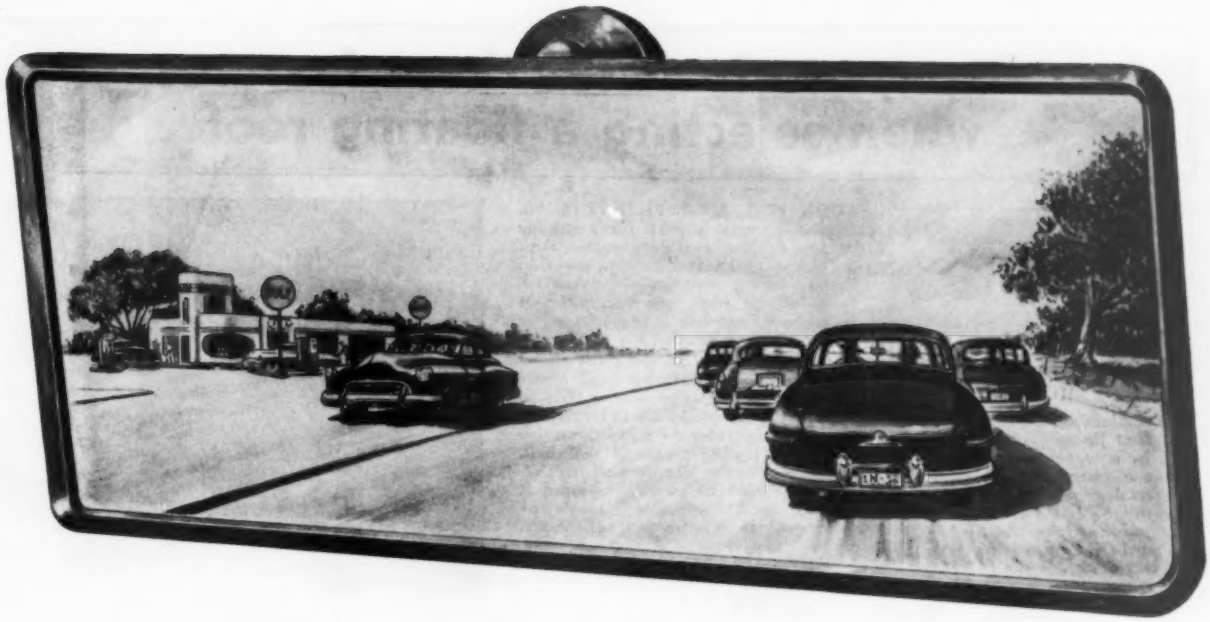
Shortly after Bermudez left the Mexican capital, the Brazilian diplomat called in the local press and told them there are "no serious obstacles" to the signing of a contract for delivery of large quantities of Mexican oil to his country.

He hinted Brazil's price for any agreement for the purchase of Mexican oil will be a substantial hike in its exports to Mexico to balance trade between the two countries.

Pemex Completes Mexican Gulf Purchase

Reports from Mexico City state that final steps have been completed in the previously announced sale of the properties of Mexican Gulf Oil Co. to Petroleos Mexicanos. For a reported sum of $2,350,000 the government oil company acquired 88,000 acres of land near Tampico, 57 storage tanks containing roundly a million barrels of crude, producing wells, pipe lines and ownership of two subsidiary companies.

Sale of the properties of Mexican Gulf which was owned by Gulf Oil Corp. severs the last remaining tie between a major United States company and Mexico. At the time when other foreign owned properties were taken over in 1938, Mexican Gulf was not included because it was not a party to the labor dispute that led to expropriation. Since that time the company has continued to operate but has sold most of its output to Pemex because of inability to obtain an export permit.



You can see a lot of the road ahead in a rear-view mirror!

THIS YEAR Gulf marks its 50th anniversary—a half century of pioneering, development, and accomplishment.

And as we look into a rear-view mirror, so to speak, those past 50 years give a pretty good picture for the future. It's a bright picture, too—for Canada, for Gulf, and for the entire oil industry.

For instance:

Fifty years ago, when production depths were shallow and costs were not great, the odds against anyone discovering a new oil field were about 30 to 1. Demand was relatively low then.

Today, discovery is more difficult and more expensive (depths may be below 12,000 feet and costs upwards of $500,000 per well). Demand is at an all-time high. However, scientific advances have helped reduce the odds of discovery to about 5 to 1!

Gulf consistently has pioneered in the development and adoption of scientific methods of exploration and production.

Fifty years ago, the search for oil was confined to solid ground. Today wells are drilled in lakes, in swamps, and in the oceans themselves. By the use of modern methods, known oil reserves have been increased to a comfortable 1191 billion gallons—the highest in history despite the constantly increasing consumption of oil and its products.

Fifty years ago, a mere handful of products was made from oil. Today research scientists in the oil laboratories have developed thousands of products in use in our daily lives. Gulf alone manufactures more than 500.

Fifty years ago, Gulf pioneered and made valuable contributions which led to the rise of Texas as a great oil state. Today Gulf is pioneering in Canada and the outlook appears good—very good.

By looking into the past, one sometimes can forecast the future. And our forecast is that Canada's future in oil will be great.

GULF OIL CORPORATION
GULF REFINING COMPANY

FIFTY YEARS OF SERVICE
1901 GULF 1951
PETROLEUM AND ITS PRODUCTS

It pays to look for these features when selecting a floating roof*

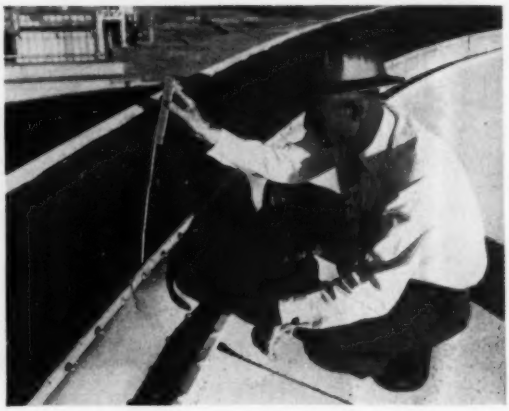
***FLOATING ROOF**

A Floating roof is a roof that floats upon the oil in a storage tank. For the interesting pictorial analogy above, thanks to the STANDARD OILER published by the Standard Oil Company of California.

LOOK FOR AN EFFICIENT SEAL. One of the most important reasons for using a floating roof on a storage tank is to prevent excessive evaporation losses during storage. The service value of the roof, however, depends largely on how well it prevents vapor from escaping around its rim.

The illustration at the right shows how effectively the Horton Seal† closes the space at the edge of the roof to prevent vapor escape. There isn't room for the thin ruler to slide down between the sealing ring and the shell. Furthermore, the Horton Seal isn't effected by climatic conditions—and it doesn't need "secondary" seals or other gadgets to improve its efficiency.

†Standard equipment on all floating roofs built by Chicago Bridge.



LOOK FOR EASY MAINTENANCE. Maintenance of a floating roof can become quite a problem if there are obstructions on the top deck. Irregularities provide places for water and dirt to collect. Naturally, this causes corrosion that deteriorates both paint and steel.

The view at the left looks across a tank equipped with a Horton Double-Deck Floating Roof. Notice that the top deck is practically free of obstructions.

To further reduce maintenance costs, the top deck's positive slope toward the center provides good drainage. This helps eliminate puddles of water on the roof —thereby further reducing maintenance costs.

The deck of a Horton Floating Roof is not allowed to rest on the bottom when the tank is empty—for it would interfere with the piping connections. So the roof is equipped with roof supports to hold it high enough to clear these connections. In the view at the left, each of the small pipe like projections is the top part of a roof support.

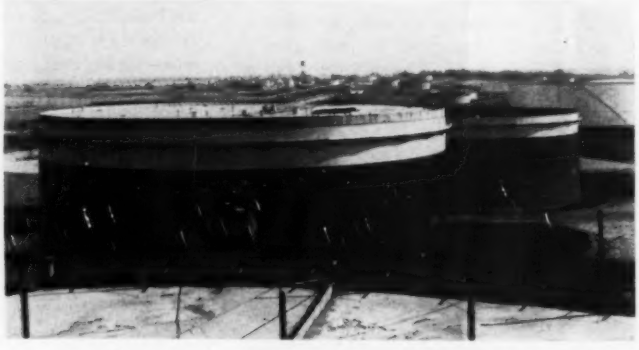
The covered manholes shown in the illustration provide access to compartments between the roof's top and bottom decks.

LOOK FOR MAXIMUM USABLE CAPACITY. There's no denying that a floating roof has a certain depth and reduces the capacity of the tank. The Horton Seal is so constructed that the tank can be filled almost to the top, however, and keeps the loss in capacity at a minimum.

As the liquid level nears the top, a part of the sealing ring extends above the tank. In the view at the right, this part of the sealing ring appears to be a black band just above the shell of the tank in the foreground. The lower portion of the sealing ring is still in close contact with the shell.

YOU GET ALL THREE OF THE ABOVE MENTIONED FEATURES WHEN YOU SPECIFY A HORTON FLOATING ROOF. Furthermore, you get the benefit of our 28 years experience building floating roofs.

Bulletin G describes these—and other features—in more complete detail. You are invited to write our nearest office for a copy.



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